FINAL

REMEDIAL INVESTIGATION REPORT FOR THE VASQUEZ-BOULEVARD AND I-70 SUPERFUND SITE OPERABLE UNIT 03 (ARGO SMELTER) DENVER, COLORADO

APPENDICES

September 2007

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FINAL
REMEDIAL INVESTIGATION REPORT FOR THE
VASQUEZ-BOULEVARD AND I-70 SUPERFUND SITE
OPERABLE UNIT 03 (ARGO SMELTER)
DENVER, COLORADO

APPENDICES

APPENDIX A

SAMPLE STATION COORDINATES

Table A-1. VBI70 OU3 Phase I Investigation Sample Station Locations

STATION	COORDINATES		ELEVATION (ft)
	Northing	Easting	
1	1710693.49	3142187.28	5215.19
2	1710635.21	3142349.27	5214.31
3	1710392.16	3141890.09	5220.95
4	1710484.04	3141922.36	5220.78
5	1710423.24	3142027.79	5218.74
6	1710476.89	3142327.24	5214.80
7	1710398.27	3142342.15	5215.17
8	1710421.52	3142523.78	5215.62
9	1710510.04	3142557.99	5214.04
10	1710180.98	3141736.81	5216.37
12	1710259.54	3141863.27	5220.76
13	1710303.44	3141862.73	5220.19
14	1710323.33	3142078.68	5220.16
15	1710323.38	3142324.47	5215.68
16	1710177.66	3142061.28	5222.64
17	1710183.81	3142285.96	5221.34
18	1710162.77	3142369.35	5220.63
19	1710142.76	3141846.31	5222.27
20	1710123.53	3141924.92	5222.73
21	1710072.07	3142250.95	5222.03
22	1710101.85	3142575.98	5217.51
23	1709967.00	3142630.42	5199.82
24	1709776.56	3141864.92	5219.36
25	1709724.64	3141959.37	5220.99
26	1709810.75	3142661.14	5197.93
27	1709505.38	3142154.89	5225.04
28	1710885.48	3141388.12	5216.12
29	1710640.99	3141410.43	5216.99
30	1709784.10	3141430.70	5221.54
31	1709530.36	3141412.83	5224.38
32	1710598.25	3142818.46	5214.01
33	1710284.93	3143031.77	5198.94
34	1710567.65	3143284.37	5200.47
35	1710798.60	3143964.16	5177.70
36	1710363.75	3143985.59	5175.37
37	1709846.85	3143935.42	5169.93

Colorado State Plate Coordinate System of 1983(92), Central Zone, US Survey Feet
Surveyed by Foresight West Surveying, Inc., January 2004

Table A-2. VBI70 OU3 Phase I Investigation Round 2 Monitoring Well Locations

STATION	COORDINATES		ELEVATION [1] (ft)
	Northing	Easting	
MW-32	1710581.51	3142892.43	5207.93
MW-33	1710322.68	3143032.19	5199.18
MW-34	1710567.32	3143346.23	5200.06 [2]
MW-35	1710792.03	3143934.39	5178.74
MW-36	1710364.20	3143986.44	5175.32

[1] Elevation at Rim

[2] Elevation is top of lid (MW-34 lid is locked)

Colorado State Plate Coordinate System of 1983(92), Central Zone, US Survey Feet

Surveyed by Foresight West Surveying, Inc., May 2004

Table A-3. VBI70 OU3 Phase I Investigation
Round 3 Sample Locations

STATION	COORDINATES		ELEVATION [1] (ft)
	Northing	Easting	
GW-15	1711586.17	3145499.59	5150.60
GW-16	1710824.50	3145105.10	5145.57
GW-17	1711543.04	3145086.76	5151.09
GW-46	1710135.04	3144651.31	5147.85
PS-1	3143762.56	1708507.98	1573.00
PS-2	3143856.68	1708465.89	1564.00
PS-3	3143973.36	1708509.17	1570.00
PS-4	3144226.05	1708559.04	1566.00
PS-5	3144473.58	1709519.96	1572.00
PS-6	3144361.02	1709543.36	1570.00
PS-7	3144290.65	1709561.18	1566.00
SW-1	3143248.27	1710848.51	1589.00
SW-2	3143946.16	1710840.41	1589.00

[1] Elevation at rim (for GW-15 through GW-46), otherwise ground elevation.

Colorado State Plate Coordinate System of 1983(92), Central Zone, US Survey Feet.

Stations GW-15 through GW-46 surveyed by Foresight West Surveying, Inc., December 2004.

Station PS-1 through PS-7 and SW-1 and SW-2 locations recorded using GPS by Knight Piesold and Co., March and May 2005.

APPENDIX B

BORING LOGS

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ROUND 1 BORING LOGS
DECEMBER 2003

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SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 1	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/19/03	Completion Date: 12/19/03	
Driller: STEVE ENS / Rig Type: DIRECT PUSH	Ground Elev: 5215.19	NORTHING 1710693.49	EASTING 3142187.28
Logged By: CAJ	Water Depth: Not Encountered		

Depth, feet	SOIL CORE: EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	75	0001B			FILL	ASPHALT 0-4" ABOVE GRAVELLY, CLAYEY SAND	10"	SAMPLE AT 4"
2			0001C				WEATHERED CLAYSTONE, MEDIUM OLIVE GRAY 5Y 5/1, MOIST, LENSES OF SANDY CLAYSTONE FROM 10" TO 6'		SAMPLE AT 1'6"
4							2" LAYER OF WHITE MINERLIZATION AT 3'-10"		
6	5-10	80	0001D						SAMPLE AT 5'10"
8						CS	MINOR IRONSTAINING FROM 10" TO 15' STIFFENS WITH DEPTH		
10	10-15	100							
12									
14									
15							BORING TERMINATED AT 15' BGS.	15'	
16									
18									
20									
22									
24									
26									
28									
30									
32							QC SAMPLES:		
34			0001A RIN-0005				PE SOIL 1-5 RINSEATE BLANK		
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411	Boring No: 2	Sheet 1 of 1	
Boring Location: SEE SITE PLAN		Start Date: 12/12/03	Completion Date: 12/12/03		
Driller: STEVE ENS	Rig Type: DIRECT PUSH	Ground Elev: 5214.31	NORTHING	EASTING	
Logged By: CAJ		Water Depth: Not Encountered	1710635.21	3142349.27	

SOIL CORE

Depth, feet	EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	80	0002A		FILL	ASPHALT 0-4" OVER GRAVELLY SANDY CLAY	2"	SAMPLE AT 4"
4			0002B		SC	CLAYEY SAND, MOIST, LOOSE, LIGHT BROWN 10YR 8/3 TO BROWN 10YR 6/3	5-8"	SAMPLE AT 4'
8	5-10	90	0002C		CS	WEATHERED CLAYSTONE, MOIST, OLIVE GRAY 5Y 5/1 STIFFENS WITH DEPTH	11'	SAMPLE AT 8'3"
12	10-14	125	0002D		SS	SANDSTONE, CLAYEY, WEAKLY CEMENTED, OCCASIONAL DECOMPOSED GRAVEL, MICACEOUS GRANITIC GRAINS, FINE MEDIUM LIGHT BROWN 10YR 8/3 MINOR IRON STAINING FROM 11' TO 14'	14'	SAMPLE AT 12'
14						REFUSAL AT 14' BELOW GROUND SURFACE		
34			0002E			QC SAMPLES: PE SOIL 1-1		

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

Graphic Log: REFUSAL

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411	Boring No: 3	Sheet 1 of 1
Boring Location: SEE SITE PLAN		Start Date: 12/18/03	Completion Date:	12/18/03
Driller: ZACK ENS	Rig Type: DIRECT PUSH	Ground Elev: 5220.95	NORTHING	EASTING
Logged By: CAJ		Water Depth: Not Encountered	1710392.16	3141890.09

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–5	5-10	60	0003A			FILL	ASPHALT 0'-4" ABOVE GRAVELLY CLAYEYS AND ABOVE APPROXIMATELY 5" OF SLAG, CINDER, BRICK.	1'	SAMPLE AT 2"
			0003B						SAMPLE AT 2'
5–10	5-10	75	0003C			CS	WEATHERED CLAYSTONE/SANDSTONE, OLIVE BROWN 10YR 6/3 VERY SANDY CLAYSTONE TO VERY CLAYEY SANDSTONE FROM 1' TO 8'		SAMPLE AT 5'
10–11	10-11	100	0003D		REFUSAL	SS	WEATHERED SANDSTONE, MICACEOUS AND GRANITIC GRAINS, GRAIN SIZE IS FINE MEDIUM, MOIST, LIGHT BROWN YELLOW 10YR 8/8 TO LIGHT BROWN 10YR 8/3 REFUSAL AT 11' BELOW GROUND SURFACE	11'	SAMPLE AT 10'6" SLOUGH IN 10'-11' TUBE DRILLER REENTERED BORING LIKELY 1' OF TRUE SAMPLE

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411	Boring No: 4	Sheet 1 of 1
Boring Location: SEE SITE PLAN		Start Date: 12/18/03	Completion Date: 12/18/03	
Driller: ENS	Rig Type: DIRECT PUSH	Ground Elev: 5220.78	NORTHING	EASTING
Logged By: CAJ		Water Depth: 11 BGS	1710484.04	3141922.36

Depth, feet	SOIL CORE: EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	80	0004A			FILL	ASPHALT 0-1" ABOVE GRAVEL, ABOVE CLAYEY SAND WITH CINDER, SLAG, BRICK FROM 1"-4', ABOVE CLEAN SAND SP FROM 4'-5' ABOVE CLAYEY SAND FROM 5'-7', ABOVE CINDER, SLAG, BRICK FROM 7'6"-11'. WET FROM 10'-11'6"		SAMPLE AT 1" WOOD AT 10' TO 10'6" CHARCOAL AT 10'6" TO 11'
5	5-10	35	0004B						SAMPLE AT 6'
10	10-15	60	0004C			CS	WEATHERED CLAYSTONE, SATURATED FROM 11'6" TO 16' LIGHT OLIVE BROWN 5Y 5/6	11'	SAMPLE AT 10'
15	15-17	130	0004D				HIGHLY WEATHERED IN ZONE OF 11'-15' COLOR IS BROWNISH YELLOW 10YR 6/8 TO BROWN 10YR 6/3 BELOW 15'		SAMPLE AT 15'6"
17					REFUSAL		REFUSAL AT 17' BELOW GROUND SURFACE	17'	
33							FILTERED AND UNFILTERED GROUNDWATER SAMPLES COLLECTED, AND GROUNDWATER QUALITY ASSURANCE SAMPLE PE 7-A.		

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411	Boring No: 5	Sheet 1 of 1	
Boring Location: SEE SITE PLAN		Start Date: 12/18/03	Completion Date: 12/18/03		
Driller: ZACK ENS	Rig Type: DIRECT PUSH	Ground Elev: 5218.74	NORTHING	EASTING	
Logged By: CAJ		Water Depth: Not Encountered	1710423.24	3142027.79	

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	65	0005A 0005B			FILL	ASPHALT 0'1" ABOVE 3" OF CLAYEY SAND ABOVE CINDER, SLAG, BRICK FROM 4" TO 10"	10"	SAMPLE AT 1" SAMPLE AT 10"
2–4						SC	CLAYEY SAND, FINE-MEDIUM, LIGHT BROWN 10YR 8/3 MOIST (MAY BE HIGHLY WEATHERED SANDSTONE)		
6	5-8	125	0005C			SS	CLAYEY WEATHERED SANDSTONE, MOIST, STIFFENS BELOW 6'6", LIGHT BROWN 10YR 8/3 TO BROWNISH YELLOW 10YR 6/8, MICACEOUS	6'8" 8'	SAMPLE AT 6'
8–10					REFUSAL		REFUSAL AT 8' BELOW GROUND SURFACE		
32							QC SAMPLES: PE SOIL 1-3		
34			0005D						

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 6	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/12/03	Completion Date: 12/12/03	
Driller: STEVE ENS / Rig Type: DIRECT PUSH	Ground Elev: 5214.80	NORTHING 1710476.89	EASTING 3142327.24
Logged By: CAJ	Water Depth: 6" OF SATURATED FILL AT 6'		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–5	0-5	35	0006A			FILL	ASPHALT 0'4", OVER GRAVELY SAND, WITH CINDER, SLAG AND BRICK FRAGMENTS		SAMPLE AT 6" 6" OF SATURATED FILL ABOVE CS BLACK AND ORANGE STAINING
5–10	5-10	55	0006B 0006C&D				WEATHERED CLAYSTONE, HIGHLY WEATHERED FROM 6' TO 10', MOIST TO VERY MOIST, LIGHT OLIVE BROWN 5Y 5/6	6'	SAMPLE AT 5'
10–15	10-15	100				CS	STIFFENS BELOW 10', ALSO SLIGHTLY MOIST BELOW 10'		SAMPLE AT 7'
15–19	15-19	125					BROWNISH YELLOW 10YR 6/8 BETWEEN 16' & 17'6" OLIVE GRAY 5Y 4/1 BELOW 17'-6"		
19					REFUSAL		REFUSAL AT 19' BELOW GROUND SURFACE	19'	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No.	03-1-411	Boring No: 7	Sheet 1 of 1
Boring Location: SEE SITE PLAN		Start Date:	12/12/03	Completion Date:	12/12/03
Driller: ZACK ENS	Rig Type: DIRECT PUSH	Ground Elev:	5215.17	NORTHING	EASTING
Logged By: CAJ		Water Depth:	10.8' BGS	1710398.27	3142342.15

SOIL CORE

Depth, feet	EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–5	0-5	20	0007A			FILL	ASPHALT 0-4" ABOVE, GRAVELLY SAND, CINDER, SLAG AT 4'10" TO 5'6", OVER SANDY CLAY OVER CINDER, SLAG FROM 5'10" TO 6', OVER CLAYEY SAND DARK BROWN 10YR 3/3		
5–10	5-10	20	0007B						OVER SATURATED FILL FROM 6'-12'
10–15	10-15	70	0007C 0007D				GLASS FRAMENTS AT 10' CLAY, HEAVILY IRON STAINED FROM 10'6" TO 12' PLASTIC, ORGANIC, CLAY, ROOTS, FROM 12 TO 20'4" GRAY AND BLACK LAMINATIONS FROM 12' TO 14'6" OLIVE GRAY 5Y 4/1	12'	ROOTS AT 14'
15–20	15-20	40				OH	VERY MOIST, OILY SHEEN, ORGANIC ODOR		
20–24	20-24	75	0007E			CS	WEATHERED CLAYSTONE, LIGHT OLIVE GRAY 5Y 6/1 MOIST.	20'	
24					REFUSAL		REFUSAL AT 24' BELOW GROUND SURFACE		
34–36							FILTERED AND UNFILTERED GROUNDWATER SAMPLE COLLECTED		

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 8	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/12/03	Completion Date:	12/12/03
Driller: ENS — Rig Type: DIRECT PUSH	Ground Elev: 5215.62	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1710421.52	3142523.78

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	65	0008A			FILL	ASPHALT 0-3", GRAVELLY SANDY CLAY TO CLAYEY SAND		SAMPLE AT 3"
2							CINDER, SLAG AND BRICK FRAMENTS FROM 1' TO 3' BLACK N 1.75/		
4			0008B						SAMPLE AT 4'
6	5-10	55				CS			
7			0008C				WEATHERED CLAYSTONE, MOIST BROWN 10YR 6/3 CLAYSTONE VERY MOIST FROM 6'6" TO 8'	6'6"	SAMPLE AT 7'
10	10-15	60							
15	15-20	100							
18							SANDY CLAYSTONE FROM 17' TO 18'		
20	20-25	100							
24			0008D						SAMPLE AT 24'
25					REFUSAL		REFUSAL AT 25' BELOW GROUND SURFACE	25'	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 9	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/12/03	Completion Date: 12/12/03	
Driller: STEVE ENS / Rig Type: DIRECT PUSH	Ground Elev: 5214.04	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1710510.04	3142557.99

SOIL CORE

Depth, feet	EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	55	0009A			FILL	ASPHALT 0-3", OVER GRAVELLY SAND, OVER GRAVELLY SANDY CLAY DARK BROWN 10YR 3/3 GRAVEL SIZE BRICK FRAGMENTS AT 1'.		SAMPLE AT 3"
5	5-10	100	0009B			SC	CLAYEY SAND, MOIST, LIGHT BROWN 10YR 8/3	6'6"	SAMPLE AT 5'6" HEAVY IRON STAINING AT BOUNDARY
7			0009C			CS	WEATHERED CLAYSTONE, MOIST, BROWN 10YR 6/3	7'	SAMPLE AT 8'6"
10	10-15	80							
15	15-20	100							
20	20-24	125	0009D				STIFFENS AT 18' OLIVE GRAY 5Y 4/1 BELOW 18' UNWEATHERED CLAYSTONE AT 18' TO 24'		SAMPLE AT 23'
24					REFUSAL		REFUSAL AT 24' BELOW GROUND SURFACE	24'	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 10	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/10/03	Completion Date: 12/10/03	
Driller: ZACK ENS / Rig Type: DIRECT PUSH	Ground Elev: 5216.37	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1710180.98	3141736.81

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0			0010A			FILL	FILL GRAVELLY CLAYEY SAND		SAMPLE AT 6"
						SM	SM SILTY SAND, BROWNISH YELLOW 10YR 6/8 SLIGHT MOIST	6"	VERY DIFFICULT TO ROLL
2	0-5	65	0010B					2'	SAMPLE AT 2'
4						CL	SANDY CLAY, LIGHT OLIVE BROWN 5Y 6/6, SLIGHT MOIST		
			0010C						SAMPLE AT 5'
6								6'	BOUNDARY NOT OBVIOUS
8	5-10	100	0010D				CLAYSTONE, LIGHT OLIVE BROWN 5YR 5/6 TO OLIVE GRAY 5YR 4/1 SLIGHT MOIST		SAMPLE AT 8'
10			0010 @ 9'-10'				PERMEABILITY SAMPLE AT 9'-10'		
12	10-15	100					WEATHERED CLAYSTONE FROM 6' TO 17'		
						CS			IRON STAINING ON FRACTURES IN CS
14									
16	15-19	125							
18							INCREASED SAND IN CLAYSTONE AT 19'6" TO 20' LIGHT OLIVE BROWN 10YR 7/8 AT 19'6"-20'		
		125							
20	19-20						REFUSAL AT 20' BELOW GROUND SURFACE	20'	
22					REFUSAL				
24									
26									
28									
30									
32									
34									
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411	Boring No: 11	Sheet 1 of 1	
Boring Location: SEE SITE PLAN		Start Date: 12/19/03	Completion Date: 12/19/03		
Driller: DEREK	Rig Type: HAND AUGUR 4"	Ground Elev:	NORTHING	EASTING	
Logged By: CAJ		Water Depth: NE			
			METHANE:		
			LEL= %		
			ppm=		

Depth, feet	SOIL CORE: EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0									
2									
4									
6									
8									
10									
12									
14									
16									
18									
20									
22									
24									
26									
28									
30									
32									
34									
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411	Boring No: 12	Sheet 1 of 1
Boring Location: SEE SITE PLAN		Start Date: 12/19/03	Completion Date:	12/19/03
Driller: DEREK	Rig Type: HAND AUGUR 4"	Ground Elev: 5220.76	NORTHING	EASTING
Logged By: CAJ		Water Depth: Not Encountered	1710259.54	3141863.27

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0			0012A				CLAYEY SAND, BLACK, CINDER/SLAG 0-3" ABOVE CLAY WITH FRAGMENTS OF CLAYSTONE 3" TO 2'		SAMPLE AT 2"
2			0012B			FILL	BRICK AT 2' AND 3'		SAMPLE AT 2' GREEN MINERALIZATION AT 4'
4							FRAGMENTS OF SLAG AND BRICK TO 4'6"		
					REFUSAL		HAND BORING REFUSAL AT 4'6" BELOW GROUND SURFACE	4'6"	BLACK TAR PAPER AT 4'6"
6									
8			--						
10									
12									
14									
16									
18									
20									
22									
24									
26									
28									
30									
32									
34									
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 13	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/19/03	Completion Date: 12/19/03	
Driller: DEREK — Rig Type: HAND AUGER 4"	Ground Elev: 5220.19	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1710303.44	3141862.73

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0			0013A				TOPSOIL 0-4" ABOVE SANDY CLAY		SAMPLE AT 0"
2						FILL	FRAGMENTS OF SLAG AND BRICK AT 1' CHARCOAL FRAGMENTS AT 1'0" VERY MOIST, BROWN 10YR 6/3 TO DARK BROWN 10YR 3/3		WHITE MINERALIZATION AT 2'6" ROOTS AT 3'
4			0013B			CS	WEATHERED CLAYSTONE, GRAY GREEN 5G 6/1, MOIST		SAMPLE AT 4'
6							HAND BORING REFUSAL AT 28' BELOW GROUND SURFACE		
8					REFUSAL				
10									
12									
14									
16									
18									
20									
22									
24									
26									
28									
30									
32									
34									
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 14	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/10/03	Completion Date: 12/10/03	
Driller: ZACK ENS — Rig Type: DIRECT PUSH	Ground Elev: 5220.16	NORTHING 1710323.33	EASTING 3142078.68
Logged By: CAJ	Water Depth: Not Encountered		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–3	0-5	55	-0014A	0.0		FILL	2" ASPHALT CLAYEY SAND, BLACK N1.75/, MOIST, FROM 2" TO 2' CLAY, DARK BROWN 10YR 3/3, MOIST, FROM 2-3'	3'	
3–19	5-10	100	-0014B			CS	WEATHERED CLAYSTONE, LIGHT BROWN 10YR 6/3 LENSES OF SANDY CLAYSTONE AT 8' TO 9' AND 12'6" TO 15' COLOR OF SANDY LENSES IS BROWNISH YELLOW 10YR 6/8		
	10-15	100	0014 @ 13'-15'				PERMEABILITY SAMPLE AT 13'-15'		
	15-20	100	-0014C					19'	
19–23	20-23	33				SS	SANDSTONE, VERY CLAYEY, WEAKLY CEMENTED MICACEOUS, MANY WHITE ZONES (CLAYS), BROWNISH YELLOW 10YR 7/8		SAMPLE AT 20'
23							SAMPLER CLOGGED AT 23' BELOW GROUND SURFACE BORING TERMINATED	23'	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411	Boring No: 15	Sheet 1 of 1	
Boring Location: SEE SITE PLAN		Start Date: 12/12/03	Completion Date: 12/12/03		
Driller: ZACK ENS	Rig Type: DIRECT PUSH	Ground Elev: 5215.68	NORTHING	EASTING	
Logged By: CAJ		Water Depth: Not Encountered	1710323.38	3142324.47	

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–5	0–5	20	0015A			FILL	ASPHALT 0-3" OVER GRAVELLY, CLAYEY SAND, DARK BROWN TO LIGHT BROWN 10YR 3/3 TO 10YR 8/3 FRAGMENTS OF GLASS, BRICK, SLAG THROUGHOUT		
5–10	5–10	30	0015B			CS	WEATHERED CLAYSTONE, MOIST, LIGHT OLIVE BROWN 5Y 5/6 TO BROWN 10YR 7/3 STIFFENS WITH DEPTH	5'3"	2" OF SATURATED FILL ABOVE CS
10–15	10–15	100	0015C			CS	VERY SANDY CLAYSTONE BELOW 15'6" GRANITIC GRAINS, MICACEOUS		
15–18	15–18	133				SS	SANDSTONE, VERY CLAYEY, LIGHT BROWN 10YR 8/3 SLIGHT MOIST REFUSAL AT 18' BELOW GROUND SURFACE	17' 18'	GRADATIONAL BOUNDARY
18					REFUSAL				

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 16	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/10/03	Completion Date: 12/10/03	
Driller: ZACK ENS / Rig Type: DIRECT PUSH	Ground Elev: 5222.64	NORTHING 1710177.66	EASTING 3142061.28
Logged By: CAJ	Water Depth: Not Encountered		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	65	0016A			FILL	ASPHALT 0-4", ABOVE CLAYEY SAND	10"	SAMPLE AT 6"
2–4						BRICK	CORED THROUGH 4' OF BRICK, GROUT VISIBLE BETWEEN BRICKS, GREEN STAINING IN GROUT AT 4'		
6	5-10	100	0016B&C			SC	CLAYEY SAND, OLIVE GRAY 5Y 4/1, MOIST	5'	SAMPLES AT 6'6"
10	10-15	100	0016D 0016 @ 11'-13'			CS	CLAYSTONE, BROWN 10YR 6/3, SLIGHT MOIST LIGHT OLIVE GRAY 5Y 6/1 PERMEABILITY SAMPLE AT 11-13' IRON STAINING IN FRACTURES WEATHERED CLAYSTONE FROM 8'6" TO APPROXIMATELY 20'	8'6"	SAMPLE AT 10'
15	15-20	100							
20	20-24	125							
24	24-28	105							
28					REFUSAL		REFUSAL AT 28' BELOW GROUND SURFACE	28'	
34			RIN-0001				QC SAMPLES: RINSEATE BLANK		

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 17	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/11/03	Completion Date:	12/11/03
Driller: ZACK ENS / Rig Type: DIRECT PUSH	Ground Elev: 5221.34	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1710183.81	3142285.96

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–4	0-5	55	0017A			FILL	2" ASPHALT, ABOVE 6" GRAVELLY CLAYEY SAND, ABOVE 1'6" OF GRAVELLY SAND (BLOCK, CINDER), MOIST		0-5' TUBE COMPRESSED TO 2'7"
4–10'6"	5-10	100	0017B 0017C			SC	CLAYEY SAND, LIGHT BROWN 10YR 8/3, TO BROWN 10YR 6/3 MOIST, GRANITIC GRAINS, MICACEOUS.	4'	SAMPLE AT 5' SAMPLE AT 9'3"
10'6"–20	10-15 15-20	100 100	0017D			CS	WEATHERED CLAYSTONE, OLIVE GRAY 5YR 4/1 IRON STAINING IN FRACTURES, SLIGHTLY MOIST	10'6"	SAMPLE AT 11-12'
20							BORING TERMINATED AT 20' BELOW GROUND SURFACE	20'	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 18	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/11/03	Completion Date: 12/11/03	
Driller: ZACK ENS / Rig Type: DIRECT PUSH	Ground Elev: 5220.63	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1710162.77	3142369.35

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–5	0-5	45	0018A (2'); 0018B (5')			FILL	GRAVELLY SAND TO 1'10" OVER CLAYEY SAND WITH CINDERS, SLAG, CHARCOAL, GLASS, AND IRON STAINING FROM 1'10" TO 4' ABOVE CLAYEY SAND VERY MOIST AT 5'	5	BLACKENED SAND, CINDERS, CHARCOAL, IRON STAINING, AND GLASS FRAGMENTS; SAMPLE AT 2'; SAMPLE AT 5'
5–6	5-10	100	0018C&D (6')			CL	SANDY CLAY, LIGHT OLIVE GRAY 5Y 6/1	6	SAMPLE AT 6'
6–28	5-10; 10-15; 15-20; 20-25; 25-28	100; 100; 95; 100; 125				CS	WEATHERED CLAYSTONE, OLIVE GRAY 5Y 4/1 SLIGHTLY MOIST DARK GRAY BETWEEN 14' AND 17' VERY SANDY CLAYSTONE BETWEEN 19' AND 19'6" AND BETWEEN 26' AND 27' HEAVY IRON STAINING IN FRACTURES BELOW 20' FRESH CLAYSTONE BELOW 16', IS NOTICEABLY DENSER THAN WEATHERED CLAYSTONE	28	
28					REFUSAL		REFUSAL AT 28' BELOW GROUND SURFACE		

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411	Boring No: 19	Sheet 1 of 1
Boring Location: SEE SITE PLAN		Start Date: 12/10/03	Completion Date: 12/10/03	
Driller: ZACK ENS	Rig Type: DIRECT PUSH	Ground Elev: 5222.27	NORTHING	EASTING
Logged By: CAJ		Water Depth: Not Encountered	1710142.76	3141846.31

Depth, feet	SOIL CORE EXTENT	SOIL CORE % RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–5	0-5	65				FILL	CLAYEY SAND-SANDY CLAY, MOIST, BRICK AND SLAG ROCK OBSERVED IN FILL 0-8" MOTTLED APPEARANCE OLIVE GRAY 5Y 4/1 TO YELLOWISH BROWN 10YR 6/8 OCCASIONAL LENSES OF LIGHT GRAY, N7, CLAYEY SAND		BLACKENED NODULES FROM 0-8"
5–10	5-10	100	0019A					8'	
10–15	10-15	100	0019B 0019 @ 12'-14'			CS	WEATHERED CLAYSTONE, OLIVE GRAY 5Y 4/1 SLIGHT MOIST IRON STAINING ON FRACTURES PERMEABILITY SAMPLE AT 12-14'		SAMPLE AT 11' BLACK MINERALIZATION AT 13'-14'
15–19	15-19	125					WEATHERED CLAYSTONE FROM 8'-23'		
19–23	19-23	125				CS-SS	BELOW 20' CLAYSTONE IS VERY SANDY APPROACHES SS WEAKLY CEMENTED SAND IS MICACEOUS. REFUSAL AT 23' BELOW GROUND SURFACE	20' 23'	
23–36					REFUSAL				

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411	Boring No: 20	Sheet 1 of 1	
Boring Location: SEE SITE PLAN		Start Date: 12/10/03	Completion Date: 12/10/03		
Driller: ZACK ENS	Rig Type: DIRECT PUSH	Ground Elev: 5222.73	NORTHING	EASTING	
Logged By: CAJ		Water Depth: Not Encountered	1710123.53	3141924.92	

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0						FILL BRICK	GRAVELLY, SANDY CLAY – CLAYEY SAND BRICK AT 8"–10"		
2	0-5	75	-0020A					10"	SAMPLE AT 2'
4						FILL	SANDY CLAY–CLAYEY SAND LIGHT BROWN 10YR 8/3		
6									
8	5-10	100	-0020B						HEAVY IRON STAINING AT 8'6" SAMPLE AT 8'7"
10							WEATHERED CLAYSTONE, BROWN 10YR 6/3 TO LIGHT OLIVE GRAY 5Y 7/1 INCREASED SAND BELOW 13'6"	8'6"	
12	10-15	100				CS			
14									
16							BORING TERMINATED AT 15' BELOW GROUND SURFACE	15'	
18									
20									
22									
24									
26									
28									
30									
32									
34									
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411	Boring No: 21		Sheet 1 of 1	
Boring Location: SEE SITE PLAN		Start Date: 12/11/03	Completion Date: 12/11/03			
Driller: ZACK ENS	Rig Type: DIRECT PUSH	Ground Elev: 5222.05	NORTHING		EASTING	
Logged By: CAJ		Water Depth: Not Encountered	1710070.45		3142248.60	

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	80	0021A			FILL	0-6" ASPHALT, OVER GRAVELLY CLAYEY SAND, ABOVE SANDY CLAY, ABOVE, GRANITIC GRAVELLY SAND, ABOVE SILTY SAND, ABOVE SANDY CLAY AT 4' AND 4'6" WHITE MINERILIZATION		SAMPLE AT 6"
4			0021B						SAMPLE AT 4'6" FILL FROM 5'-6'6" MOTTLED GREEN-BROWN WHITE CLAYEY BLOBS AT CONTACT
6.5								6'6"	
8	5-10	105	0021C			CS	WEATHERED CLAYSTONE, LIGHT OLIVE GRAY 5Y 6/1 SLIGHTLY MOIST, DECREASING MOISTURE WITH DEPTH		SAMPLE AT 8'
12	10-15	80					MINOR IRON STAINING IN FRACTURES OCCASIONAL BLACK, SOFT, NODULE, ORGANIC		
15							BORING TERMINATED AT 15' BELOW GROUND SURFACE	15'	

Depth scale, feet: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 22	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/12/03	Completion Date:	12/12/03
Driller: STEVE ENS / Rig Type: DIRECT PUSH	Ground Elev: 5217.51	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1710101.85	3142575.98

SOIL CORE

Depth, feet	EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–2	0-5	60	-0022A			FILL	ASPHALT 0-3" OVER GRAVEL, OVER CLAYEY SAND, OVER BRICK		
2–6						BRICK	BRICK FROM 2'6" TO 6'	2'6"	
6–10	5-10	40	-0022B			FILL	CINDER/SLAG FROM 6' TO 8' SANDY CLAY-CLAYEY AND FILL, BROWNISH YELLOW 10YR 6/8	6'	
10–15	10-15	75	-0022C				WEATHERED CLAYSTONE, OLIVE GRAY 5Y 4/1 MOIST, IRON STAINING IN FRACTURES N3/ BETWEEN 11' AND 12'6"	10'6"	SHARP BOUNDARY
15–20	15-20	100				CS	SANDY CLAYSTONE BELOW 22'6"		
20–25	20-25	100	-0022D				MARKED COLOR CHANGE IN CS AT 22'6" LIGHT OLIVE GRAY 5Y 5/1, CORRELATES WITH SANDY CLAYSTONE MANY ORGANICS AT 22'6" TO 24' IN VERTICAL AND HORIZONTAL FRACTURES? ORGANICS ARE BLACK WITH OILY LUSTER, CLAYSTONE NEAR ORGANICS IS COLORED LIGHT BROWNISH YELLOW 10YR 8/8		22'6" TO 26' IS NOTICEABLY MOISTER THAN SURROUNDING CLAYSTONE
25–27	25-27	110							
27					REFUSAL		REFUSAL AT 27' BELOW GROUND SURFACE	27'	
32–36			RIN-0003 SB-0022E				QC SAMPLES: RINSEATE BLANK PE SOIL 1-2		

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411	Boring No: 23	Sheet 1 of 1	
Boring Location: SEE SITE PLAN		Start Date: 12/19/03	Completion Date: 12/19/03		
Driller: STEVE ENS	Rig Type: DIRECT PUSH	Ground Elev: 5199.82	NORTHING	EASTING	
Logged By: CAJ		Water Depth: Not Encountered	1709967.00	3142630.42	

Depth, feet	SOIL CORE: EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	55	0023A			FILL	TOPSOIL 0-2" ABOVE SLIGHTLY GRAVELLY SANDY CLAY, DRY-SLIGHTLY MOIST		RARE BRICK GRAVEL IN 0-6" SAMPLE AT 1" SAMPLE AT 2'
2			0023B					1'6"	
4							WEATHERED CLAYSTONE, OLIVE GRAY 5Y 4/1, SLIGHTLY MOIST		
6	5-10	100					IRON STAINING IN FRACTURES BELOW 10'		
8							DARK GRAY N3 AT 13'6" TO 13' 11"		
10	10-15	80	0023C			CS	STIFFENS WITH DEPTH TO 9' CONSTANT BELOW 9'		SAMPLE AT 10'
12									
14									
16	15-20	80							
18									
20							BORING TERMINATED AT 20' BELOW GROUND SURFACE	20'	
22									
24									
26									
28									
30									
32									
34									
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 24	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/19/03	Completion Date: 12/19/03	
Driller: STEVE ENS / Rig Type: DIRECT PUSH	Ground Elev: 5219.36	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1709776.56	3141864.92

Depth, feet	SOIL CORE EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-3	100	0024A&B				TOPSOIL 0-4" ABOVE CLAYEY SAND WITH CLUSTS OF CLAYSTONE, MOIST, BROWN 10YR 6/3.		SAMPLE AT 6"
2							MANY LOCALIZED ZONES OF HEAVY IRON STAINING AROUND ORGANICS.		WHITE MINERALIZATION AT 4'
4	3-7	130					OCCASIONAL FINE LAYERS OF SANDS AND CLAYS, MANY FRAGMENTS OF BLACK-GREEN CLAYSTONE, STIFFENS BELOW 4'6" BUT STILL CONTAINS CLAYSTONE CLASTS IN SANDS.		
6	5-7	120	0024D						SAMPLE AT 6'6"
8					REFUSAL		REFUSAL AT 7.5' BELOW GROUND SURFACE		
10									
12									
14									
16									
18									
20									
22									
24									
26									
28									
30									
32									
34			0024C				Qc SAMPLES: PE SOIL 1-9		
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411		Boring No: 25	Sheet 1 of 1
Boring Location: SEE SITE PLAN		Start Date: 12/19/03		Completion Date: 12/19/03	
Driller: STEVE ENS	Rig Type: DIRECT PUSH	Ground Elev: 5220.99		NORTHING	EASTING
Logged By: CAJ		Water Depth: Not Encountered		1709724.64	3141959.37

Depth, feet	SOIL CORE EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-2'6"	125	-0025A			FILL	TOPSOIL 0-5' ABOVE CLAYEY SAND WITH CLASTS OF DARK GRAY-GREEN CLAYSTONE, LIGHT BROWN 10YR 8/3 TO BROWNISH YELLOW 10YR 6/8 SLIGHTLY MOIST, STIFF		SAMPLE AT 2"
2	2'6"-5'	125							
5	5-6'	210	-0025B						SAMPLE AT 5'6"
6					REFUSAL		REFUSAL AT 6' BELOW GROUND SURFACE		SAMPLE TUBE REPEATEDLY STUCK IN PIPE

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 26	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/19/03	Completion Date:	12/19/03
Driller: STEVE ENS / Rig Type: DIRECT PUSH	Ground Elev: 5197.93	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1709810.75	3142661.14

Depth, feet	SOIL CORE EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–3	0-5	95	0026A (0'), 0026B&C (~3')			FILL	GRAVELLY CLAYEY SAND FROM 0 TO 2', SANDY CLAY FROM 2'-3' (BLACK), CINDER, SLAG, FROM 1'8" TO 2'	3'	SAMPLE AT 3" / SAMPLE AT 3' SHARP COLOR CHANGE
3–14	5-10	100				CS	WEATHERED CLAYSTONE, SLIGHT MOIST, OLIVE GRAY 5Y 4/1 IRON STAINING IN FRACTURES, MANY DECOMPOSED ORGANICS BELOW 6', VERY STIFF LIGHT OLIVE GRAY 5Y 6/1 BELOW 9'6"		
	10-15	125							
14					REFUSAL		REFUSAL AT 14' BELOW GROUND SURFACE	14'	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 27	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/11/03	Completion Date: 12/11/03	
Driller: ZACK ENS / Rig Type: DIRECT PUSH	Ground Elev: 5225.04	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1709505.38	3142154.89

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	60	0027A			FILL	TOPSOIL 0-2", GRAVELY SANDY CLAY WITH CINDERS AND PEBBLES OF SLAG TO 4'6" BRICK FROM 4'6" TO 7' GRAVELLY SANDY CLAY WITH CINDERS/SLAG FROM 7'-11'		
5	5-10	30	0027B				CLAYEY SAND, ORGANICS AT 11'-6" -12'6" FROM 11' TO 15'6"		5-10 FEET SAMPLE IS VERY COMPRESSED/OR MISSING
10	10-15	100	0027C				LAYER OF SANDY GRAVEL WITH BRICK AND SLAG FROM 15'6" TO 16'6"		HEAVY IRON STAINING IN HORIZONTAL BANDS FROM 13' TO 15'
15	15-18	145	0027D						
18	18-22	125	0027E			CS	CLAYSTONE, DARK GRAY N3/ MOIST IRON STAINING IN FRACTURES, STIFF	18'6"	
22	22-25	100							ORGANICS AT 22'6"
25	25-27						VERY SANDY AT 26'6"-27' REFUSAL AT 27' BELOW GROUND SURFACE	27'	
27					REFUSAL				

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411	Boring No: 28	Sheet 1 of 1
Boring Location: SEE SITE PLAN		Start Date: 12/10/03	Completion Date:	12/10/03
Driller: ZACK ENS	Rig Type: DIRECT PUSH	Ground Elev: 5218.68	NORTHING	EASTING
Logged By: CAJ		Water Depth: Not Encountered	1710885.48	3141388.12

Depth, feet	SOIL CORE EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-3	75				FILL	ASPHALT 0-3" FILL GRAVELLY CLAYEY SAND		SAMPLE AT 11"-1'11"
2			0028A			CL	SANDY CLAY, OLIVE GRAY, 5Y 4/1 SLIGHTLY MOIST		
4	3-10	0							3'-9'6" STUCK IN PIPE
6						SC-CL	CLAYEY SAND TO SANDY CLAY, BROWNISH YELLOW 10YR 6/8, MICACEOUS.		
8									EASIER DRILLING NOTED AT 8'
10			0028B			SC	CLAYEY SAND, LIGHT OLIVE BROWN 5Y 5/6 MOIST VERY MOIST-WET AT 10'-10'8"		SAMPLE AT 10'-10.5'
	10-14	105				CL	11'-1"-13' WEATHERED CLAYSTONE SANDY CLAY, LIGHT OLIVE BROWN 5Y 5/6 MOIST		
12			0028C						
14	14-18	110					CLAYSTONE, OLIVE GRAY, 5Y 4/1 - LIGHT BROWN GRAY 5YR 6/1		SAMPLE AT 14'-15'
16									
18	18-22	105	0028D			CS			
20									
22	22-24	105							
24	24-26	100	0028E						SAMPLE AT 24'-25.5'
26					REFUSAL		REFUSAL AT 26' BELOW GROUND SURFACE		
28									
30									
32									
34									
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 29	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/10/03	Completion Date:	12/10/03
Driller: ZACK ENS / Rig Type: DIRECT PUSH	Ground Elev: 5216.99	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1710640.99	3141410.43

Depth, feet	SOIL CORE: EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	65				FILL	GRAVEL FILL, ROUNDED GRAINS FROM 0-2" ABOVE		
2			0029A				GRAVELLY CLAYEY SAND	1'10"	SAMPLE AT 1'10"
						CL	SILTY SANDY CLAY, OLIVE GRAY 5Y 4/1 SLIGHT MOIST		
4								4'	
5	5-10	98	0029B				CLAYSTONE, OLIVE GRAY 5Y 4/1 FROM 4'-9'		SAMPLE AT 5'
							WEATHERED CLAYSTONE FROM 4'-10'		
8							BROWNISH YELLOW FROM 9'-10' INCREASED SAND IN CLAYSTONE BETWEEN 9'-10'		
10	10-15	100	0029C				OLIVE GRAY 5Y 4/1 TO BROWNISH GRAY 5YR 4/1 BELOW 10'		SAMPLE AT 11'
14						CS			
15	15-19	125	0029D						SAMPLE AT 15'5"
19	19-23	100	0029E				IRON STAINING IN FRACTURES		SAMPLE AT 20'
23					REFUSAL		REFUSAL AT 23' BELOW GROUND SURFACE	23'	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 30	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/11/03	Completion Date:	12/11/03
Driller: ZACK ENS / Rig Type: DIRECT PUSH	Ground Elev: 5221.54	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1709784.10	3141430.70

SOIL CORE

Depth, feet	EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	50	0030A 0030B			FILL	TOPSOIL 0-2", SANDY CLAY WITH FRAGMENTS OF BRICK	6"	SAMPLE AT SURFACE SAMPLE AT 6"
2–4						CS	WEATHERED CLAYSTONE, BROWN 10YR 6/3 SLIGHTLY MOIST, WHITE BLEBS AT 6"-1', STIFF		
6	5-10	100					VERY SANDY-SILTY FROM 5'-9' (BROWNISH YELLOW 10YR 6/8)	8'	
8–10			0030C			SS	SANDSTONE, WEEKLY CEMENTED, CLAYEY, LIGHT BROWN 10YR 8/3 OCCASIONAL IRON STAINED BAND, LOOSE	10'8"	SAMPLE AT 9'
12–14	10-15	100				CS	WEATHERED CLAYSTONE, OLIVE GRAY 5Y 4/1, SLIGHTLY MOIST, IRON STAINING LONG FRACTURES, STIFF.		
16–18	15-19	125							
19							BORING TERMINATED AT 19' BELOW GROUND SURFACE	19'	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 31	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/11/03	Completion Date:	12/11/03
Driller: ZACK ENS / Rig Type: DIRECT PUSH	Ground Elev: 5224.38	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1709530.36	3141412.83

Depth, feet	SOIL CORE EXTENT	SOIL CORE % RECOVERY	SOIL CORE Laboratory Sample ID	SOIL CORE PID Reading (ppm)	SOIL CORE Graphic Log	SOIL CORE U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	65	0031A			FILL	2" TOPSOIL OVER GRAVELLY CLAYEY SAND BITS OF BRICK AT 8"-10"		SAMPLE AT 10"
2							WEATHERED CLAYSTONE, BROWN 10YR 6/3 TO OLIVE GRAY 5Y 4/1		
4	5-10	100	0031B				MOIST IRON STAINING IN FRACTURES		SAMPLE AT 5'
6									
8							UNWEATHERED, "FRESH" CLAYSTONE AT 17' DARK GRAY N3/ DRY -SLIGHT MOIST		
10	10-15	100	0031C						SAMPLE AT 10'
12									
14						CS			
16	15-19	125							
18									APPROXIMATE BOUNDARY OF UNWEATHERED CLAYSTONE
20	19-23	95							
22									
24	23-25	95					COLOR RETURNS TO BROWNISH YELLOW 10YR 6/8 BELOW 28'.		
26	25-29	105					INCREASED IRON STAINING THROUGHOUT SAMPLE AT 28'		
28							REFUSAL AT 29' BELOW GROUND SURFACE		
30					REFUSAL				
32			RIN-0002				QC SAMPLES: RINSEATE BLANK		
34									
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 32	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/12/03	Completion Date: 12/12/03	
Driller: ZACK ENS; Rig Type: DIRECT PUSH	Ground Elev: 5214.01	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1710598.25	3142818.46

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	60	0032A			FILL	ASPHALT 0-4" ABOVE GRAVEL, ABOVE GRAVELLY SANDY CLAY, CINDERS/SLAG, CHIPS OF RUSTED METAL FROM 6' TO 8'6" STAINED ORANGE-BLACK		SAMPLE AT 4"
6	5-10	60	0032B						SAMPLE AT 6'
8.5			0032C						SAMPLE AT 9'
9						SC	SLIGHTLY SANDY CLAY, MOIST, LIGHT OLIVE BROWN 5Y 5/6		
11	10-15	90							
14			0032D			CS	WEATHERED CLAYSTONE, MOIST, OLIVE GREEN 5Y 4/1 STIFFENS WITH DEPTH, MINOR IRON STAINING IN FRACTURES		SAMPLE AT 13'10"
15	15-20	90							
20	20-25	100							
24			0032E						SAMPLE AT 24'
25							BORING TERMINATED AT 25' BELOW GROUND SURFACE		

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 33	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/18/03	Completion Date: 12/18/03	
Driller: ZACK ENS / Rig Type: DIRECT PUSH	Ground Elev: 5198.94	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1710284.93	3143031.77

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	75	0033A			FILL	ASPHALT 0-4", ABOVE GRAVEL, ABOVE CLAYEY SAND.		SAMPLE AT 4" STIFFENS AND DARKENS AT 2'-6"
2–4			0033B			SC	CLAYEY SAND, DARK BROWN 10YR 3/3, MOIST	2'6"	SAMPLE AT 3'
4–10	5-10	75	0033C			SP-SM	SLIGHTLY SILTY SAND, MOIST BROWN 10YR 6/3 NOTICEABLY SOFTER THAN THE SC FROM 2'6"-4'6"	4'6"	SAMPLE AT 9'
10–14	10-15	125							
15–17	15-20	90	0033D			SP-GP	GRAVELLY SAND TO SANDY GRAVEL, PINK 5R 7/4 TO LIGHT GRAYN7/ GRANITIC GRAINS, SUBANGULAR, WET FROM 16'6" TO 17'3"	14'10"	SAMPLE AT 15'
17–20			0033E			CS	WEATHERED CLAYSTONE, OLIVE GREEN 5Y 4/1 SLIGHTLY MOIST	17'	SAMPLE AT 18' ORGANICS AT 18'
20					REFUSAL		REFUSAL AT 20' BELOW GROUND SURFACE	20'	
22–32									
33			RIN-0004				Qc SAMPLES: RINSEATE BLANK		
34–36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411	Boring No: 34	Sheet 1 of 1	
Boring Location: SEE SITE PLAN		Start Date: 12/18/03	Completion Date: 12/18/03		
Driller: ZACK ENS	Rig Type: DIRECT PUSH	Ground Elev: 5200.47	NORTHING	EASTING	
Logged By: CAJ		Water Depth: Not Encountered	1710567.65	3143284.37	

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	55	0034A			FILL	ASPHALT 0-4" ABOVE 3" OF GRAVEL, ABOVE CLAYEY SAND FROM 7" TO 4'6" ABOVE BRICK FROM 4'6" TO 5', ABOVE CLAYEY SAND, LIGHT BROWN 10YR 8/3		SAMPLE AT 4"
2									1" OF BLACK AND AT 7'6"
4			0034B						SAMPLE AT 4'6"
6	5-10	48							
8								7'6"	DENSE AT CONTACT POSSIBLE GROUND SURFACE
10	10-15	60	0034C&D			SP-SM	SILTY SAND, LIGHT BROWN 10YR 7/3, MOIST, LOOSE TO MEDIUM DENSE		SAMPLE AT 11'
12									
14									
16	15-20	75				SP-GP	GRAVELLY SAND, LAYERS OF SANDY GRAVEL, GRANITIC GRAINS, SUBANGULAR, SLIGHTLY MOIST	16'6"	SHARP CONTACT
18			0034E					17'6"	SHARP CONTACT SAMPLE AT 18'
20	20-24	125	0034F			CS	WEATHERED CLAYSTONE, SLIGHTLY MOIST, YELLOWISH GRAY 5Y 8/1, LIGHT OLIVE BROWN 5Y 5/6 IRONSTAINING IN FRACTURES		SAMPLE AT 21'
22									
24					REFUSAL		REFUSAL AT 24' BELOW GROUND SURFACE	24'	
26									
28									
30									
32									
34									
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 03-1-411	Boring No: 35	Sheet 1 of 1	
Boring Location: SEE SITE PLAN		Start Date: 12/18/03	Completion Date: 12/18/03		
Driller: ZACK ENS	Rig Type: DIRECT PUSH	Ground Elev: 5177.70	NORTHING	EASTING	
Logged By: CAJ		Water Depth: Not Encountered	1710798.60	3143964.16	

Depth, feet	SOIL CORE EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	40	0035A			FILL	ASPHALT 0-3" ABOVE GRAVEL CLAYEY SANDS, OCCASIONAL GRAVEL, DARK BROWN 10YR 3/3	8"	SAMPLE AT 6" VERY MOIST BETWEEN 4' & 9'
4	5-10	60				SC	POSSIBLY OLD FILL		
9			0035B 0035C			SP	COARSE SAND, OCCASIONAL GRAVEL, MOIST	9'2"	SAMPLE AT 9' SAMPLE AT 9'10" SHARP CONTACT SHARP CONTACT
10	10-15	100				CS	WEATHERED CLAYSTONE, SLIGHTLY MOIST, LIGHT OLIVE BROWN 5Y 8/8, WHITE MINERALIZATION FROM 9'8" TO 11' VERY STIFF	9'8"	
15							BORING TERMINATED AT 15' BELOW GROUND SURFACE	15'	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 36	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/19/03	Completion Date: 12/19/03	
Driller: STEVE ENS / Rig Type: DIRECT PUSH	Ground Elev: 5175.37	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1710363.75	3143985.59

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	40	0036A			FILL	TOPSOIL 0-3" ABOVE CLAYEY SAND, OCCASIONAL GRAVEL, IRON STAINING FROM 0 TO 7' BROWN 10YR 6/3		SAMPLE AT 3"
2									ROOT AT 2'6" & 5'
4									
5	5-10	20	0036B						SAMPLE AT 5'
6									ROCK IN NOSE OF SAMPLER 1' RECOVERED FROM 5'-10'
8									
10	10-15	95					GRANITIC GRAVEL FROM 10' TO 11'		
11			0036C					11'2"	SAMPLE AT 11'
12						CS	CLAYSTONE SLIGHT MOIST-DRY, OLIVE GRAY 5Y 5/1 VERY STIFF		
14									
16	15-18	115					MOIST BELOW 15'6"		
18							BORING TERMINATED AT 18' BELOW GROUND SURFACE	18'	
20									
22									
24									
26									
28									
30									
32									
34									
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 03-1-411	Boring No: 37	Sheet 1 of 1
Boring Location: SEE SITE PLAN	Start Date: 12/18/03	Completion Date: 12/18/03	
Driller: ZACK ENS / Rig Type: DIRECT PUSH	Ground Elev: 5169.93	NORTHING	EASTING
Logged By: CAJ	Water Depth: Not Encountered	1709846.85	3143935.42

SOIL CORE

Depth, feet	EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	60	0037A			FILL	CLAYEY SAND, OCCASIONAL GRAVEL, BROWN TO LIGHT BROWN DRY-SLIGHTLY MOIST		SAMPLE AT SURFACE
5	5-10	90	0037B			SP-GP	GRAVELLY SAND, MOIST, GRANITIC	6'	SAMPLE AT 5'10"
10	10-14	90	0037C			CS	CLAYSTONE, SLIGHTLY MOIST-DRY, BROWNISH GRAY 5Y R 4/1 FROM 6' TO 11', LIGHT OLIVE BROWN 5Y 5/6 BELOW 11', STIFF, WHITE MINERALIZATION FROM 6' TO 10'. IRON STAINING IN FRACTURES VERY SANDY CLAYSTONE BELOW 13'		SAMPLE AT 10'
14		300							
15	14-15						BORING TERMINATED AT 15' BELOW GROUND SURFACE	15'	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

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ROUND 2 BORING LOGS

APRIL 2004

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SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 04-1-247	Boring No: MW-32	Sheet 1 of 1
Boring Location: Village Inn Parking Lot	Start Date: 04/08/04	Completion Date: 04/08/04	
Driller: Dustin / Kyle — Rig Type: DIRECT PUSH	Ground Elev: 5207.93	NORTHING	EASTING
Logged By: Derek Bowman	Water Depth: Not Encountered	1710581.51	3142892.43

Depth, feet	EXTENT	% RECOVERY	Well Inner Casing - 2" pvc	Outer Sand Pack & Seal	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–5		55		CONCRETE 0"-10" BENTONITE 10"-3' COLO. SILICA SAND 10/20 3' - 13'	FILL	ASPHALT 0-7", FILL, SANDY CLAY, RUST STAINS AT 4' WITH METAL PIECES, DARK BROWN	5'	FLUSH MOUNT 0-10" BLANK 0"-3' SCREEN 3'-13'
5–10		100			CS	WEATHERED CLAYSTONE, MOIST TO DRY, DRY AT 10' TO 15', DUSKY YELLOW 5Y 6/4		
10–15		100		BENTONITE 13' -15'		BORING BACKFILLED WITH BENTONITE FROM 13' TO 15' BGS.	15'	

Depth scale (feet): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 04-1-247	Boring No: MW-33	Sheet 1 of 1
Boring Location: SOUTH SIDE OF BEST WESTERN	Start Date: 04/08/04	Completion Date: 04/08/04	
Driller: Dustin / Kyle — Rig Type: DIRECT PUSH	Ground Elev: 5199.18	NORTHING	EASTING
Logged By: Derek Bowman	Water Depth: 16' 6"	1710322.68	3143032.19

SOIL CORE

Depth, feet	EXTENT	% RECOVERY	Well Inner Casing - 2" pvc	Outer Sand Pack & Seal	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–2	0 - 5	65		CONCRETE 0"-10"; BENTONITE 10" - 6'	FILL	ASPHALT 0-6" FILL, SANDY CLAY, DARK BROWN	2'	FLUSH MOUNT 0-10" BLANK 0"-8' SCREEN 8' TO 18'
2–4					SC	CLAYEY SAND, DARK BROWN, 10YR 4/2, MOIST	4'	
4–15	5 - 10	75		COLO. SILICA SAND 10/20 6' - 16' 9"	SP-SM	SILTY SAND, DRY TO MOIST, 10YR 7/4 LOOSE	15'	
	10 - 15	80						
15–16.5	15 - 20	100			SP-GP	GRAVELLY SAND, MOIST TO WET, PINK, 5YR 8/4 GRANITIC GRAINS	16'6"	
16.5–20				COLLAPSED 16'9"-18' BENTONITE 18'-20'	CS	GROUND WATER DEPTH MEASURED AT 16' 6" WEATHERED CLAYSTONE, LIGHT OLIVE BROWN. 5 YR 5/6		

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 04-1-247	Boring No: MW-34	Sheet 1 of 1
Boring Location: EAST OF BEST WESTERN	Start Date: 04/08/04	Completion Date: 04/08/04	
Driller: Dustin / Kyle — Rig Type: DIRECT PUSH	Ground Elev: 5199.15	NORTHING	EASTING
Logged By: Derek Bowman	Water Depth: Not Encountered	1710567.32	3143346.23

SOIL CORE

Depth, feet	EXTENT	% RECOVERY	Well Inner Casing - 2" pvc	Outer Sand Pack & Seal	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0				CONCRETE 0"-6"					STICKUP STEEL RISER
0–5		60		BENTONITE 6" - 9' 3"		FILL	FILL, CLAYEY SAND, MOIST, TWIGS, CONCRETE BRICK AT 6' 6"-7' 0"		BLANK 0"-11'3" SCREEN 11' 3"-21'3"
5–10		80						7'	
7–16						SP-SM	SILTY SAND, DARK YELLOWISH ORANGE 10 YR 6/6, MOIST, LOOSE 10 YR 5/4, MODERATE YELLOWISH BROWN AT 10'-16'		
9'3"–21'3"				COLO. SILICA SAND 10/20 9' 3" - 21' 3"					
10–15		85							
15–20		100						16'	
16–20'2"						SP-GP	GRAVELLY SANDS, SLIGHTLY MOIST, SOME COBBLES GRANITIC GRAINS, MODERATE ORANGE PINK TO LIGHT BROWN 5 YR 8/4 TO 5 YR 5/6	20'2"	
20–21'3"		300				CS	WEATHERED CLAYSTONE AT 20'2" 5Y 6/4		
							21' 3" REFUSAL		

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 04-1-247	Boring No: MW-35	Sheet 1 of 1
Boring Location: N.E. CORNER SALVATION ARMY	Start Date: 04/08/04	Completion Date: 04/08/04	
Driller: Dustin / Kyle; Rig Type: DIRECT PUSH	Ground Elev: 5178.74	NORTHING	EASTING
Logged By: Derek Bowman	Water Depth: Not Encountered	1710792.03	3143934.39

SOIL CORE

Depth, feet	EXTENT	% RECOVERY	Well Inner Casing - 2" pvc	Outer Sand Pack & Seal	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0 - 5	60		CONCRETE 0"-10"; BENTONITE		FILL	ASPHALT 0-4" FILL, DARK BROWN, MOIST	2'	FLUSH MOUNT 0-10" BLANK 0"-7' SCREEN 7' TO 12'
2						SP-GP	SANDS, GRAVELLY SAND 10YR 5/4 MODERATE YELLOWISH BROWN GRAVEL LENS AT APPROXIMATELY 4' 6"		
5	5 - 10	60		COLO. SILICA SAND 10/20			GRAVELS AT 8' 6" TO 11' 5 YR 8/4 TO DRY 5YR 7/2		
10	10 - 13'11"	0		BENTONITE 12'-13'11"		CS	WEATHERED CLAYSTONE (CONFIRMED THROUGH SMALL SLICE IN LINER) BORING BACKFILLED WITH BENTONITE FROM 13'11" TO 12' BGS LINER PACKED FULL AND UNRETRIEVABLE FROM PROBE AT 10' - 13' 11"	11' 13' 11"	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70	Project No. 04-1-247	Boring No: MW-36	Sheet 1 of 1
Boring Location: S.E. CORNER SALVATION ARMY	Start Date: 04/08/04	Completion Date: 04/08/04	
Driller: Dustin / Kyle — Rig Type: DIRECT PUSH	Ground Elev: 5175.32	NORTHING	EASTING
Logged By: Derek Bowman	Water Depth: Not Encountered	1710364.20	3143986.44

Depth, feet	SOIL CORE: EXTENT	% RECOVERY	Well Inner Casing - 2" pvc	Outer Sand Pack & Seal	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–5	0 - 5	65		CONCRETE 0"-10"; BENTONITE 10"-2'6"; COLO. SILICA SAND 10/20 2' 6" - 9' 6"		FILL	TOPSOIL 0-3" CLAYEY SAND, IRON STAINING, MINERALIZATION, 10YR 6/2 TO 10YR 4/2	6'	FLUSH MOUNT 0-10" BLANK 0"-4'6" SCREEN 4'6" TO 9'6"
6–8	5 - 10	100				SP-GP	GRAVELLY SANDS, SLIGHTLY MOIST 5 YR 8/4 TO 5 YR 7/2	8'	
8–10						CS	WEATHERED CLAYSTONE, LIGHT OLIVE GRAY 5Y 5/2	9'6"	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

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ROUND 3 BORING LOGS
MAY 2005

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SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70, OU3	Project No. 05-1-258	Boring No: PS-1	Sheet 1 of 1
Boring Location: I-70 and 1-25	Start Date:	Completion Date: 5/2/05	
Driller: Zach / Rig Type: Direct Push	Ground Elev:	NORTHING	EASTING
Logged By: CAJ	Water Depth: 12.8'		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–5	0-5	45					FILL: SANDY CLAY, MOIST, DARK GRAY N3 TO MEDIUM GRAY NS		3" OF TOPSOIL, FRAGMENTS OF BRICK 0-1', FRAGMENTS OF CS 6"-1'
5–10	5-10	50					SLIGHTLY SILTY SAND WITH OCCASIONAL GRAVEL, DRY-MOIST 6'-12'6", WET BELOW 12/6", LIGHT BROWN 10YR 8		
10–15	10-15	55					WEATHERED CLAYSTONE, SLIGHTLY MOIST, BROWNISH YELLOW 10YR 6/8 FROM 14'-14'6", DARK GREENISH GRAY SG 4/1 FROM 14'6"-15'		KNIGHT PIESOLD STOPPED BORING AT 15'

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70, OU3	Project No. 05-1-258	Boring No: PS-2	Sheet 1 of 1
Boring Location: I-70 and I-25	Start Date:	Completion Date: 5/2/05	
Driller: Zach / Rig Type: Direct Push	Ground Elev:	NORTHING	EASTING
Logged By: CAJ	Water Depth: NE		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–2	0-5	50					FILL: SANDY CLAY, DRY-MOIST, DARK GRAY N3		3" OF TOPSOIL
2–12	5-10	55					SLIGHTLY SILTY GRAVELLY SAND, DRY 2'-11'6", MOIST 11'6"-12', BROWN 10YR 6/3 TO BROWNISH YELLOW 10YR B/4		
12–15	10-15	80					VERY WEATHERED CLAYSTONE, MOIST, SLIGHTLY SANDY-SANDY, MEDIUM GRAY NS		NO STRUCTURE
15									KNIGHT PIESOLD STOPPED BORING AT 15'

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70, OU3	Project No. 05-1-258	Boring No: PS-3	Sheet 1 of 1
Boring Location: I-70 and I-25	Start Date:	Completion Date: 5/2/05	
Driller: Zach / Rig Type: Direct Push	Ground Elev:	NORTHING	EASTING
Logged By: CAJ	Water Depth: 14.3'		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–5	0-5	35					FILL: SANDY CLAY, MOIST, DARK BROWN, 10YR 3/3 AT 0-1' TO OLIVE GRAY SY 4/1 BELOW 1'		MOTTLED
5–10	5-10	40					SLIGHTLY CLAYEY SAND WITH OCCASIONAL GRAVELS, DRY 5'6" TO 14', WET BELOW 14', LIGHT BROWN 10YR 8/3, LOOSE		
10–15	10-15	70							
15–20	15-20	80	JAR SAMPLE APPROX. 16'-6"				SANDY LEAN CLAY, MOIST, DARK GRAY, N3		
							SLIGHTLY CLAYEY SAND, WET, BROWN, 10YR 6/3		
							SANDY LEAN CLAY, MOIST, DARK GRAY N3		
20–23	20-23	130	JAR SAMPLE 20'-21'				SLIGHTLY CLAYEY SAND, MOIST 19'6"-21, WET BELOW 21' BROWN 10YR 6/3		
							CLAYSTONE, SLIGHTLY MOIST, HARD, MEDIUM BLUISH GRAY SB 4/1		REFUAL AT 23'

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70, OU3	Project No. 05-1-258	Boring No: PS-4	Sheet 1 of 1
Boring Location: I-70 and I-25	Start Date:	Completion Date: 5/2/05	
Driller: Zach / Rig Type: Direct Push	Ground Elev:	NORTHING	EASTING
Logged By: CAJ	Water Depth: 12.1'		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–5	0-5	50							4" OF TOPSOIL.
5–10	5-10	55					SLIGHTLY SILTY TO SLIGHTLY CLAYEY SAND, OCCASIONAL GRAVELS 6'-20', COMMON GRAVELS 20'-28'6", SLIGHTLY MOIST TO MOIST 6'-14'6", WET BELOW 14'6", LIGHT BROWN 10YR 8/3		
10–15	10-15	30	JAR SAMPLE 15'-16'						
15–20	15-20	80							
20–25	20-25	0					MORE CLAY AND DISCOLORATION (DARK BROWN 10YR 3/3 AT 17')		
25–29	25-29	0					WESTHERED CLAYSTONE, MOIST, IRON STAINED, MEDIUM OLIVE GRAY 5Y 5/1		DRILLER CALLED HOLE AT 29'

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70, OU3		Project No. 05-1-258	Boring No: PS-5	Sheet 1 of 1
Boring Location: I-70 and I-25		Start Date:	Completion Date: 5/2/05	
Driller: Zach	Rig Type: Direct Push	Ground Elev:	NORTHING	EASTING
Logged By: CAJ		Water Depth: 11.25'		

SOIL CORE

Depth, feet	EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–5	0-5	60					FILL: SANDY CLAY WITH OCCASIONAL GRAVEL, SLIGHTLY MOIST-MOIST, BROWNISH GRAY 5YR 4/1 TO BROWN 10YR 6/3		CHARCOAL FRAGMENTS AT 1'
5–10	5-10	60							
10–15	10-15	25	JAR SAMPLE 13'-14'				SLIGHTLY SILTY SAND, OCCASIONAL GRAVELLY, MOIST 5'6"-11', WET BELOW 11', LIGHT BROWN GRAY 5YR 6/1 TO LIGHTLY BROWN 10YR 8/3		
15–20	15-20	60							
20–25	20-25	0							
25–27'6"	25-27'6"	0							DRILLER CALLED HOLE WHEN IT ABRUBTLY STIFFENED
27'6"–36							POTENTIALLY BEDROCK, SANDSTONE NO RECOVERY		

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70, OU3	Project No. 05-1-258	Boring No: PS-6	Sheet 1 of 1
Boring Location: I-70 and 1-25	Start Date:	Completion Date: 5/2/05	
Driller: Zach / Rig Type: Direct Push	Ground Elev:	NORTHING	EASTING
Logged By: CAJ	Water Depth: 11.8' Under Artesian Pressure		

Depth, feet	SOIL CORE: EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–6	0-5	30					FILL: MIXED CLAYEY SAND AND SANDY CLAY, SLIGHLTY MOIST-MOIST, DARK BROWN 10YR 3/3 FROM 0'-3', BROWN 10YR 6/4 FROM 3'-6'		CHARCOAL FRAGMENTS AT 1'-2'
6–14	5-10	60					SILTY GRAVELLY SAND, DRY, LIGHT BROWN 10YR 7/3		
	10-15	25							*DURING DRILLING WATER WAS NOT ENCOUNTERED ABOVE 16'6"/AFTER DRILLING WATER AT 11.8' SUGGESTS THAT THE SP-SC UNIT WAS UNDER ARTASIAN WATER PRESSURE
14–16.5							SANDY CLAY, MOIST, OLIVE BROWN 7.5YR 5/6		
16.5–22	15-20	80	JAR SAMPLE 17'-18'				SLIGHTLY CLAYEY SAND WITH OCCASIONAL LENSES OF SANDY CLAY, GRAVELLY FROM 20'-21'6", WET, BROWNISH YELLOW 10YR 6/8 TO BROWN 10YR 6/3		
22–22.5	20-22'6"	15					SILTY TO CLAYEY SANDSTONE, MOIST, LIGHT BLUISH GRAY 5B 7/1		REFUSAL AT 22'6"

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

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SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70, OU3	Project No. 05-1-258	Boring No: PS-7	Sheet 1 of 1
Boring Location: I-70 and 1-25	Start Date:	Completion Date: 5/2/05	
Driller: Zach / Rig Type: Direct Push	Ground Elev:	NORTHING	EASTING
Logged By: CAJ	Water Depth: 12.7'		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–5	0-5	50					FILL: MIXED CLAYEY SAND AND SANDY CLAY, MOIST, OCCASIONAL GRAVEL, BROWN 10YR 6/3 FROM 0'-5', DARK BROWNISH GRAY 5YR 6/1 FROM 5'		
5–8	5-10	30					IRON STAINING 5'-8'	8	
8–10							SLIGHTLY CLAYEY GRAVELLY SAND, DRY 8'-12.7', WET BELOW 12.7', LIGHT BROWN 10YR 8/3		
10–15	10-15	0							STIFFENS BELOW 10'
15–15'6"	15-15'6"	100					SILTY-CLAYEY SANDSTONE, MOIST, DARK GRAY N4	15 / 15'6"	REFUSAL AT 15'6"

Depth scale, feet: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

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ROUND 4 BORING LOGS

SEPTEMBER 2005

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SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: ARGO SMELTER	Project No. 05-1-460	Boring No: PS-11	Sheet 1 of 1
Boring Location: 51st & WASHINGTON	Start Date: 09/20/05	Completion Date: 09/20/05	
Driller: JUSTIN/ESN — Rig Type: DIRECT PUSH	Ground Elev:	NORTHING	EASTING
Logged By: CAJ	Water Depth: 9.62'		

Depth, feet	SOIL CORE EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0							ASPHALT		4.25"
0–3	0-5	55				FILL	CLAYEY GRAVELY SAND, DARK BROWN 10YR3/3 TO BROWN 10YR6/3, MOIST	3'	CONTAINS CHARCOAL FRAGMENTS
3–4						SP	POORLY GRADED SAND, BROWN 10YR6/3, MOIST	4'	FINE TO COARSE GRAINED SAND
4–6						CL	SANDY CLAY, MOIST, BROWNISH GRAY 5YR4/1, IRONSTAINED.	6'	FINE SAND
6–7.5	5-10	55				SC	CLAYEY SAND, MOIST, IRONSTAINED, THIN LENSES OF SANDY CLAY	7'6"	FINE SAND
7.5–9.5						GC	CLAYEY SANDY GRAVEL, MOIST, LIGHT BROWN 10YR8/3 TO PINK 5R7/4	9'5"	FINE TO COARSE GRAINED SAND
9.5–30	10-15	40				SP-SC	SLIGHTLY CLAYEY GRAVELY SAND, WET, BROWN 10YR6/3, OCCASIONALLY LAYER OF POORLY GRADED SAND		
	15-20	75							FINE TO COARSE GRAINED
	20-25	0							
	25-30	0						30'	SCREEN @ 30'-10'
30–36									BOTTOM 6.2' FEET OF SCREEN FILLED WITH FLOWING SAND

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: ARGO SMELTER	Project No. 05-1-460	Boring No: PS-12	Sheet 1 of 1
Boring Location: WASHINGTON	Start Date: 09/20/05	Completion Date: 09/20/05	
Driller: DUSTIN | Rig Type: DIRECT PUSH	Ground Elev:	NORTHING	EASTING
Logged By: CAJ	Water Depth: 10.23'		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–4'	0-5	60				FILL	TOPSOIL CLAYEY SAND, MOIST, BROWN 10YR4/3, FROM 4"-1' SLIGHTLY CLAYEY SAND, MOIST, BROWN 10YR7/3, FROM 1'-1'6" CLAYEY SAND, MOIST TO VERY MOIST, DARK BROWN 10YR3/3 TO DARK GRAY N3	4" 4'	FRAGMENTS OF CHARCOAL, FINE TO COARSE SAND
4–7'						CL	SANDY CLAY, MOIST, BROWNISH GRAY 5YR4/1 TO DARK GRAY N3	7'	LENSE OF CLAYEY SAND AT 5'6"
7–7'6"	5-10	50				SC	CLAYEY SAND, MOIST, MICACEOUS, YELLOWISH RED 5YR4/6, IRONSTAINED.		7'6" FINE SAND
7'6"–28'	10-20 20-25 20-25	20 0 0				SP	POORLY GRADED SAND, MOIST 7'6"-10', WET BELOW 10', OCCASIONAL LAYERS OF SP-SC OR SP-SM LIGHT BROWN 10YR8/3	28'	10-20' STUCK IN CORE BARREL, LINER LOST, LITHOLOGY ESTIMATED FROM CUTTINGS SCREEN FROM 24.9'-8' 3.9' OF SCREEN CUT OFF DUE TO SAND FLOWING UNDER END CAP AT BASE OF SCREEN

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: ARGO SMELTER	Project No. 05-1-460	Boring No: PS-13	Sheet 1 of 1
Boring Location: WASHINGTON & 50th	Start Date: 09/20/05	Completion Date: 09/20/05	
Driller: JUSTIN/ESN — Rig Type: DIRECT PUSH	Ground Elev:	NORTHING	EASTING
Logged By: CAJ	Water Depth: 5.86'		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	50					TOPSOIL 4"		FINE TO COARSE SAND
						FILL	FILL: CLAYEY SAND, MOIST, DARK BROWN 10YR3/3	1'	
2						CL	SANDY CLAY WITH OCCASIONAL LAYERS/LENSES OF SC, MOIST TO VERY MOIST.		FINE SAND
4								5'	
	5-10	45				SP-SC	SLIGHTLY CLAYEY SAND, WET, YELLOWISH RED 5YR4/6 WITH THIN LENSES OF CLAYEY SAND,	6'	PERCHED WATER FROM IRRIGATION
6						SC	FAT CLAY, VERY MOIST, OLIVE GRAY 5Y4/1	8'6"	
						GP-GC	SLIGHTLY CLAYEY SANDY, GRAVEL, MOIST, PINK 5R7/4 TO BROWN 10YR6/3	8'	FINE TO COARSE SAND
8									FINE TO COARSE SAND
10	10-20	30				SP	POORLY GRADED GRAVELLY SAND, LIGHT REDDISH ORANGE 10R6/6 MOIST 8'-9' WET BELOW 9' OCCASIONAL LAYER OF GP & SP-SM GRAVEL=GRANITE, QUARTZITE, AND GNEISS		10-20 ADVANCED TOGETHER
12									
14									
16									
18									
20	20-25	0							
22									
24									
25	25-28	0							SCREEN FROM 28'-8' BOTTOM 3.6' OF SCREEN FILLED WITH FLOWING SAND
26									
28							STOPPED BY KNIGHT PIESOLD	28'	
30									
32									
34									
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: ARGO SMELTER	Project No. 05-1-460	Boring No: PS-14	Sheet 1 of 1
Boring Location: 50th	Start Date: 09/20/05	Completion Date: 09/20/05	
Driller: JUSTIN/ESN — Rig Type: DIRECT PUSH	Ground Elev:	NORTHING	EASTING
Logged By: CAJ	Water Depth: 8.66'		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–3	0-5	60				FILL	CLAYEY SAND, DRY, DARK BROWN 10YR3/3, FROM 0-1' CONCRETE 1'-2' CLAYEY SAND, MOTTLED, BROWN 10YR5/3 TO BROWNISH YELLOW 10YR6/8, DRY, FROM 2'-3'.	3'	FINE TO MEDIUM SAND
3–9	5-10	*				SP-SM	SLIGHTLY SILTY SAND, DRY, LIGHT BROWN 10YR8/3, IRONSTAINED (10YR6/8) AT 6'-7'	9'	FINE TO MEDIUM SAND *% RECOVERY NOT RECORDED
9–30	10-20	50				SP	POORLY GRADED SAND, LIGTH BROWN 10YR8/3 TO PINK 5R7/4, MOIST 9'-9'6" WET BELOW 9'6" (DURING DRILL) GRAVELLY AT 13'-15', GRANITIC GRAVELS.		FINE TO COARSE SAND FLOWING SAND AT 15', DRILLER CONTINUED TO 20'
	20-25	0							
	25-28	0							
30							STOPPED BY KNIGHT PIESOLD	30'	SCREEN AT 30'-10' BOTTOM 4.7' OF SCREEN FILLED WITH FLOWING SAND

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: ARGO SMELTER	Project No. 05-1-460	Boring No: PS-15	Sheet 1 of 1
Boring Location: EAST OF 4945 PEARL	Start Date: 09/19/05	Completion Date: 09/19/05	
Driller: JUSTIN/ESN; Rig Type: DIRECT PUSH	Ground Elev:	NORTHING	EASTING
Logged By: CAJ	Water Depth: 11.2'		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–2	0-5	60			FILL	GRAVELLY CLAYEY SAND, DRY, BROWN 10YR6/3	2'	FINE TO COARSE SAND
2–2'6"					SC	CLAYEY SAND, SLIGHTLY MOIST, LIGHT BROWN 10YR8/3		2'6" FINE SAND
2'6"–4'6"					CL	SANDY CLAY, DARK BROWN 10YR3/3, MOIST,	4'6"	FINE SAND
4'6"–12	5-10	65			SP	SLIGHTLY GRAVELLY SAND, LIGHT BROWN 10YR8/3 TO LIGHT REDDISH ORANGE 10R6/6 DRY FROM 4'5" TO 5', SLIGHTLY MOIST FROM 5' TO 9'6" WET BELOW 9'6" (DURING DRILL).	12'	FINE TO COARSE SAND
12–16	10-15	70			SP-SC	SLIGHTLY CLAYEY SAND, WET, BROWN 10YR7/3	16'	FINE TO COARSE SAND
16–30	15-20	60			SP	SLIGHTLY GRAVELLY SAND, WET, BROWN 10YR7/3, GRANITIC GRAVEL.		FINE TO COARSE SAND
	20-25	0						SCREEN AT 30'-10'
	25-30	0					30'	BOTTOM 1.5' OF SCREEN FILLED WITH FLOWING SAND
30						STOPPED BY KNIGHT PIESOLD		

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: ARGO SMELTER		Project No. 05-1-460	Boring No: PS-16	Sheet 1 of 1
Boring Location: PEARL & 49th		Start Date: 09/19/05	Completion Date: 09/19/05	
Driller: JUSTIN/ESN	Rig Type: DIRECT PUSH	Ground Elev:	NORTHING	EASTING
Logged By: CAJ		Water Depth: 9.8'		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	65				FILL	GRAVELLY CLAYEY SAND, MOIST TO DRY, BROWN 10YR6/3	1'6"	FINE TO COARSE SAND
2						SC	CLAYEY SAND, MOIST, DARK BROWN 10YR3/3	2'	FINE SAND
						SP	POORLY GRADED SAND, DRY, BROWN 10YR6/3	3'	FINE SAND
4						SC	VERY CLAYEY SAND, BROWNISH GRAY 5YR4/1 MINOR IRONSTAINING	4'6"	FINE SAND
6	5-10	50							
8						SP	GRAVELLY SAND, DRY TO SLIGHTLY MOIST, LIGHT BROWN 10YR8/3, WET BELOW 11' (DURING DRILL) GRAVEL=GRANITE AND QUARTZITE 1" THICK LENSE OF CLAYEY SAND AT 7'6"		FINE TO COARSE SAND
10	10-15	45							
12								14'	
14						OH	ORGANIC CLAY, MANY ROOTS AND OTHERS ORGANICS, VERY MOIST, BLACK N1.75, IRONSTANED		14'6" SLIGHTLY ODOR OF DECAY
16	15-20	0							
18						SP	GRAVELLY SAND, WET, BROWN 10YR7/3 OCCASIONAL LAYER OF SP-SM GRAVEL=GRANITE AND QUARTZITE		FINE TO COARSE SAND
20	20-25	0							
22									
24									
26	25-30	0							SCREEN AT 30'-10'
28									BOTTOM 5' OF SCREEN FILLED WITH FLOWING SAND
30							STOPPED BY KNIGHT PIESOLD	30'	
32									
34									
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: ARGO SMELTER	Project No. 05-1-460	Boring No: PS-17	Sheet 1 of 1
Boring Location:	Start Date: 09/15/05	Completion Date: 09/19/05	
Driller: JUSTIN/ESN / Rig Type: DIRECT PUSH	Ground Elev:	NORTHING	EASTING
Logged By: CAJ	Water Depth: 9.6'		

SOIL CORE

Depth, feet	EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)
0–5	0-5	60		
5–10	5-10	80		
10–15	10-15	65		
15–20	15-20	70		
20–25	20-25	0		
25–30	25-30	0		

U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
	TOPSOIL	4"	
FILL	MIXED SANDY CLAY & CLAYEY SAND, MOIST BROWNISH GRAY 5YR4/1 TO DARK GRAY N3, FRAGMENTS OF SLAG AND CHARCOAL	3'6"	
SP	POORLY GRADED SAND, DRY, LIGHT BROWN 10YR8/3	7'	FINE TO MEDIUM SAND
CL	SANDY TO SILTY CLAY, MOIST, DARK GRAY N3 TO DARK OLIVE BROWN 5Y5/6	8'6"	
SM	SILTY SAND, MOIST, BROWN 10YR6/3, THINLY LAMINATED	9'	
CL	SANDY TO SILTY CLAY, MOIST, DARK GRAY N3 TO DARK OLIVE BROWN 5Y5/6	9'6"	
SP-SM	SLIGHTLY SILTY SAND, WET, BROWN 10YR6/3	13'	
GP	POORLY GRADED SANDY GRAVEL, WET, BROWN 10YR6/3 GRAVELS=QUARTZITE, GRANITE, GNEISS	16'	FINE TO COARSE SAND
SP	POORLY GRADED GRAVELLY SAND, WET, BROWN 10YR6/3	30'	FINE TO COARSE SAND
	STOPPED BY KNIGHT PIESOLD		SCREEN 30'-25' 20'-10'

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name:	ARGO SMELTER	Project No.	05-1-460	Boring No: PS-18	Sheet 1 of 1
Boring Location:	47th & LOGAN	Start Date:	09/19/05	Completion Date:	09/19/05
Driller: JUSTIN/ESN	Rig Type: DIRECT PUSH	Ground Elev:		NORTHING	EASTING
Logged By:	CAJ	Water Depth:	12.2'		

SOIL CORE

EXTENT	% RECOVERY	Laboratory Sample ID	PID Reading (ppm)
0-5	55		
5-10	75		
10-15	60		
15-20	90		
20-25	10		
25-30	0		

Depth, feet	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0		TOPSOIL		4"
0-4'6"	FILL	CLAYEY SAND, VERY MOIST, OLIVE GRAY 5Y4/1	4'6"	GLASS FRAGMENTS AT 4'
4'6"-6'6"	SP	POORLY GRADED SAND, DRY, LIGHT BROWN 10YR8/3	6'6"	FINE TO COARSE SAND
6'6"-7'6"	SC	CLAYEY SAND, BROWN 10YR6/3, VERY MOIST		FINE SAND 7'6"
7'6"-30'	SP	GRAVELLY SAND, BROWN 10YR7/3 SLIGHTLY MOIST FROM 7'6" TO 11', WET BELOW 11', DURING DRILL HEAVY IRONSTAINING (BROWNISH YELLOW 10YR 6/8) LENSE OF SP-SM AT APPROXIMATELY 12' TO 13'		FINE TO COARSE SAND FLOWING SAND BELOW 15'
30		STOPPED BY KNIGHT PIESOLD	30'	SCREEN 30'-10'

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: ARGO SMELTER	Project No. 05-1-460	Boring No: PS-19	Sheet 1 of 1
Boring Location: 46th & GRANT	Start Date: 09/19/05	Completion Date: 09/19/05	
Driller: JUSTIN/ESN — Rig Type: DIRECT PUSH	Ground Elev:	NORTHING	EASTING
Logged By: CAJ	Water Depth: 11.5'		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	SOIL CORE: Laboratory Sample ID	SOIL CORE: PID Reading (ppm)	SOIL CORE: Graphic Log	SOIL CORE: U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0–2	0-5	50				FILL	CLAYEY GRAVELLY SAND, BROWN 10YR7/3, DRY FROM 0-1' CLAYE SAND, DRY, LIGHT BROWNISH GRAY 5YR6/1 TO DARK GRAY N3, CALCAREOUS	2'	
2–6						SC	VERY CLAYEY SAND, DRY, BROWN 10YR3/3, MINOR IRONSTAINING.	6'	GRAVELS BENT LINER CAUSING LOW RECOVERY
6–15	5-10	20				SP-SM	SLIGHTLY SILTY GRAVELLY SAND, DRY TO SLIGHTLY MOIST, WET BELOW 11' (DURING DRILL),, LIGHT REDDISH ORANGE 10R6/6 GRANITIC GRAVELS OCCASIONAL LENSE OF IRONSTAINING AT APPROXIMATELY 12' AND 15'	13'	
	10-15	60							
15–25	15-20	100				SP	POORLY GRADED SAND, <5% SILT, WET, LIGHT BROWN 10YR8/3.		DRILLER REPORTS FLOWING SAND BELOW 20'
	20-25	70						25'	
25							STOPPED DUE TO FLOWING SAND		SCREEN AT 25'-20' & 10'-15'

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: ARGO SMELTER	Project No. 05-1-460	Boring No: PS-20	Sheet 1 of 1
Boring Location: SOUTH END OF LOGAN	Start Date: 09/20/05	Completion Date: 09/20/05	
Driller: JUSTIN/ESN; Rig Type: DIRECT PUSH	Ground Elev:	NORTHING	EASTING
Logged By: CAJ	Water Depth: NE		

Depth, feet	SOIL CORE: EXTENT	SOIL CORE: % RECOVERY	Laboratory Sample ID	PID Reading (ppm)	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0-5	55					ASPHALT	[illegible]	
						FILL	SANDY CLAY, SLIGHTLY MOIST, BROWN 10YR6/3 OCCASIONAL ROOT	2'	FINE TO COARSE SAND
2						SP-SC	SLIGHTLY CLAYEY SAND, BROWN 10YR6/3	4'6"	FINE TO MEDIUM SAND
4						CL	SANDY CLAY, BROWN 10YR6/3, BLENDING DOWN TO LIGHT OLIVE BROWN 5Y5/6, SLIGHTLY MOIST		COARSE SAND 5'6"
6	5-10	100							STIFFINS WITH DEPTH
8						WCS	WEATHERED CLAYSTONE, SLIGHTLY MOIST, LIGHT OLIVE BROWN 5Y5/6 FROM 5'6" TO 8' TO BROWN 10YR6/3 FROM 8' TO 12', INCREASING SAND BELOW 10' BUT STILL WEATHERED CLAYSTONE		FINE TO MEDIUM SAND
10	10-12	150							
12								12'	REFUSAL
14									
16									
18									
20									
22									
24									
26									
28									
30									
32									
34									
35									

APPENDIX C

ANALYTICAL DATA

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PHASE I INVESTIGATION

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Analytical Results for Soil

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Table C-1.
Soil Sampling Results (mg/kg)

		1			1			1			1			2		
Station		1			1			1			1			2		
Sample Type		Field QC - PE Std			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0001-A			01-VBOU3-SB-0001-B			01-VBOU3-SB-0001-C			01-VBOU3-SB-0001-D			01-VBOU3-SB-0002-A		
Parent Sample ID		1-5														
Sample Date/Time		12/19/2003 10:56			12/19/2003 11:00			12/19/2003 11:05			12/19/2003 11:10			12/12/2003 11:35		
Depth_upper (ft bgs)					0.33			1.50			5.83			0.33		
Depth_lower (ft bgs)					0.83			3.00			6.92			2.50		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	2300			20000			31000			30000			16000		
Antimony	1	3.2		J	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	130			4.3			3.8			ND			5.1		
Barium	1	350			100			180			29			350		
Beryllium	0.5	ND			0.76			0.95			1.1			ND		
Cadmium	0.5	2			ND			ND			ND			ND		
Calcium	20	39000			20000			8400			8200			15000		
Chromium	1	7.2			15			13			12			9.4		J
Cobalt	1	13			15			15			3.6			9.5		
Copper	2	1300			11			11			16			3.8		J
Iron	10	4800			18000			28000			22000			15000		
Lead	0.8	1300			11			16			18			8.9		
Magnesium	20	16000			4200			5100			4100			3200		
Manganese	1	760		J	250		J	570		J	230		J	340		
Mercury	0.033	0.27			ND			ND			ND			ND		
Nickel	4	9.4			12			15			7			6.5		
Potassium	300	790			1700			1400			1400			810		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			ND		
Sodium	500	ND			ND			1200			1300			660		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	250		J	44		J	46		J	33		J	38		
Zinc	2	1800			58			69			50			46		
Percent Moisture		0.73			17			20			24			14		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		2			2			2			2			3		
Sample Type		Field			Field			Field			Field QC - PE Std			Field		
Sample ID		01-VBOU3-SB-0002-B			01-VBOU3-SB-0002-C			01-VBOU3-SB-0002-D			01-VBOU3-SB-0002-E			01-VBOU3-SB-0003-A		
Parent Sample ID											1-1					
Sample Date/Time		12/12/2003 11:40			12/12/2003 11:45			12/12/2003 11:55			12/18/2003 11:40			12/18/2003 10:50		
Depth_upper (ft bgs)		4.00			8.50			12.00						0.17		
Depth_lower (ft bgs)		5.00			10.00			13.00						2.00		
Analyte	**DL**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**
Aluminum	10	21000			28000			25000			2200			15000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	2.9		J	ND		UJ
Arsenic	1	3.7			1.1			6.9			130			12		
Barium	1	160			36			340		J	340			320		J
Beryllium	0.5	ND			0.96			0.56			ND			1.9		
Cadmium	0.5	ND			ND			ND			1.8			ND		
Calcium	20	5500			6800			8600			36000			27000		
Chromium	1	11		J	15		J	16			7.1		J	9.8		
Cobalt	1	15			5.2			10			11			8.3		
Copper	2	5		J	8.7		J	7.7			1300		J	1300		
Iron	10	18000			20000			29000			4400			21000		
Lead	0.8	9			30			7.1		J	1300			270		J
Magnesium	20	3600			4500			3800			15000			2000		
Manganese	1	330			400			350		J	710			550		J
Mercury	0.033	ND			ND			ND			0.2			ND		
Nickel	4	9.4			8.9			7.6			9.2			12		
Potassium	300	870			1800			1400			750			950		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			13		J
Sodium	500	780			1300			1600			ND			1500		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	49			36			51			260			28		
Zinc	2	54			53			71			1700			80		
Percent Moisture		17			24			16			15			26		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		3			3			3			4			4		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0003-B			01-VBOU3-SB-0003-C			01-VBOU3-SB-0003-D			01-VBOU3-SB-0004-A			01-VBOU3-SB-0004-B		
Parent Sample ID																
Sample Date/Time		12/18/2003 10:55			12/18/2003 11:00			12/18/2003 11:10			12/18/2003 9:30			12/18/2003 9:35		
Depth_upper (ft bgs)		2.00			5.00			10.50			0.08			6.00		
Depth_lower (ft bgs)		3.50			6.17			11.00			3.00			10.00		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	24000			24000			28000			7400			13000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	1.4			5.9			9			18			2.4		
Barium	1	500		J	580		J	330		J	160		J	74		J
Beryllium	0.5	0.62			0.71			1			ND			ND		
Cadmium	0.5	ND			ND			ND			3.2		J	ND		
Calcium	20	27000			13000			6400			5600			2500		
Chromium	1	12			12			14			7.6			15		
Cobalt	1	4.4			13			11			4.6			4.9		
Copper	2	10			8.6			11			200			12		
Iron	10	17000			18000			22000			10000			16000		
Lead	0.8	11		J	10		J	13		J	190		J	11		J
Magnesium	20	4600			5000			5000			1600			2400		
Manganese	1	290		J	310		J	440		J	180		J	210		J
Mercury	0.033	ND			ND			ND			0.14			ND		
Nickel	4	5.9			9.5			10			7.7			8		
Potassium	300	1500			1500			1900			1200			2600		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			2.1		J	ND		
Sodium	500	1000			1500			2200			ND			ND		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	37			38			55			23			31		
Zinc	2	45			53			68			210			43		
Percent Moisture		19			18			16			13			13		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		4			4			5			5			5		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0004-C			01-VBOU3-SB-0004-D			01-VBOU3-SB-0005-A			01-VBOU3-SB-0005-B			01-VBOU3-SB-0005-C		
Parent Sample ID																
Sample Date/Time		12/18/2003 9:40			12/18/2003 9:45			12/18/2003 11:45			12/18/2003 11:48			12/18/2003 11:50		
Depth_upper (ft bgs)		10.00			15.50			0.00			0.83			6.50		
Depth_lower (ft bgs)		12.50			17.00			0.50			2.50			7.50		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	17000			28000			8100			17000			20000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	6			2.5			28			6.2			4.2		
Barium	1	410		J	570		J	280		J	720		J	360		J
Beryllium	0.5	ND			0.64			0.95			ND			ND		
Cadmium	0.5	150		J	7.3		J	0.73		J	ND			ND		
Calcium	20	5100			8800			13000			15000			6000		
Chromium	1	9.9			13			8			10			9.1		
Cobalt	1	7.9			6.1			5.9			7.1			6.5		
Copper	2	10			10			710			5.4			4.9		
Iron	10	16000			26000			11000			14000			20000		
Lead	0.8	9.4		J	8.5		J	160		J	6.4		J	11		J
Magnesium	20	3000			3700			1600			2600			3900		
Manganese	1	150		J	360		J	230		J	170		J	210		J
Mercury	0.033	ND			ND			0.12			ND			ND		
Nickel	4	10			8			8.3			6.8			6.6		
Potassium	300	1600			1300			950			940			1000		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			12		J	ND			ND		
Sodium	500	1200			2200			940			1400			1100		
Thallium	1.2	1.2			ND			ND			ND			ND		
Vanadium	2	33			51			20			33			42		
Zinc	2	2100			700			150			44			52		
Percent Moisture		25			16			14			16			16		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		5			6			6			6			6		
Sample Type		Field QC - PE Std			Field			Field			Field			Field QC - Duplicate		
Sample ID		01-VBOU3-SB-0005-D			01-VBOU3-SB-0006-A			01-VBOU3-SB-0006-B			01-VBOU3-SB-0006-C			01-VBOU3-SB-0006-D		
Parent Sample ID		1-3												01-VBOU3-SB-0006-C		
Sample Date/Time		12/18/2003 11:58			12/12/2003 12:50			12/12/2003 13:00			12/12/2003 13:05			12/12/2003 13:05		
Depth_upper (ft bgs)					1.00			5.00			7.00			7.00		
Depth_lower (ft bgs)					4.50			6.50			10.00			10.00		
Analyte	**DL**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**
Aluminum	10	2300			36000			22000			28000			32000		
Antimony	1	2.9		J	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	140			11			29			3.9			1.7		
Barium	1	350		J	1800			280			69			72		
Beryllium	0.5	ND			2.5			0.56			0.82			0.88		
Cadmium	0.5	1.9		J	ND			12			25			24		
Calcium	20	40000			40000			5000			7500			8800		
Chromium	1	7.2			23		J	16		J	14		J	16		J
Cobalt	1	12			14			4.8			9.3			12		
Copper	2	1300			49		J	620		J	67		J	29		J
Iron	10	4900			21000			21000			25000			25000		
Lead	0.8	1300		J	110			170			18			19		
Magnesium	20	16000			7400			3700			3800			4100		
Manganese	1	730		J	200			110			310			340		
Mercury	0.033	0.4			0.26			1.3			ND			0.033		
Nickel	4	9.5			19			25			61			58		
Potassium	300	740			1400			2500			2200			2500		
Selenium	1.3	ND			4			ND			ND			ND		
Silver	1	ND			ND			2.5			ND			ND		
Sodium	500	ND			10000			790			1300			1400		
Thallium	1.2	ND			ND			6.4			ND			ND		
Vanadium	2	250			64			39			37			43		
Zinc	2	1900			75			360			520			440		
Percent Moisture		0.39			11			28			25			25		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		7			7			7			7			7		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0007-A			01-VBOU3-SB-0007-B			01-VBOU3-SB-0007-C			01-VBOU3-SB-0007-D			01-VBOU3-SB-0007-E		
Parent Sample ID																
Sample Date/Time		12/12/2003 13:25			12/12/2003 13:30			12/12/2003 13:40			12/12/2003 13:45			12/12/2003 13:50		
Depth_upper (ft bgs)		0.33			5.00			10.50			14.00			20.67		
Depth_lower (ft bgs)		5.00			10.00			12.00			15.00			22.00		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	4300			15000			11000			16000			29000		
Antimony	1	ND		UJ	3.6		J	85		J	ND		UJ	ND		UJ
Arsenic	1	1.1			24			2900			11			4.7		
Barium	1	48			1100			250			140			33		
Beryllium	0.5	ND			0.64			ND			ND			1.2		
Cadmium	0.5	ND			ND			130			510			ND		
Calcium	20	1400			31000			2300			18000			7200		
Chromium	1	11		J	71		J	9.8		J	11		J	22		J
Cobalt	1	3.9			17			4.6			5			7.2		
Copper	2	10		J	330		J	3100		J	83		J	23		J
Iron	10	9900			140000			120000			19000			19000		
Lead	0.8	8.9			430			1600			32			17		
Magnesium	20	1500			2500			1800			3100			4600		
Manganese	1	120			540			96			370			250		
Mercury	0.033	ND			ND			1.5			0.046			ND		
Nickel	4	6.5			96			39			8.9			16		
Potassium	300	1900			1200			3200			2700			2700		
Selenium	1.3	ND			ND			3.5			ND			ND		
Silver	1	ND			1.2			29			1.1			ND		
Sodium	500	ND			3600			1100			880			1100		
Thallium	1.2	ND			ND			12			ND			ND		
Vanadium	2	21			26			24			30			48		
Zinc	2	37			500			1000			3500			65		
Percent Moisture		3.8			20			44			27			21		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		8			8			8			8			9		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0008-A			01-VBOU3-SB-0008-B			01-VBOU3-SB-0008-C			01-VBOU3-SB-0008-D			01-VBOU3-SB-0009-A		
Parent Sample ID																
Sample Date/Time		12/12/2003 10:55			12/12/2003 11:00			12/12/2003 11:05			12/12/2003 11:10			12/12/2003 10:00		
Depth_upper (ft bgs)		0.25			4.00			7.00			24.00			0.25		
Depth_lower (ft bgs)		2.00			6.00			9.50			25.00			2.00		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	14000			18000			29000			27000			12000		
Antimony	1	2.1		J	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	9.5			17			1.3			ND			10		
Barium	1	790			240			35			30			230		
Beryllium	0.5	0.71			ND			1			0.82			ND		
Cadmium	0.5	14			ND			ND			ND			ND		
Calcium	20	24000			12000			15000			6900			5500		
Chromium	1	20		J	10		J	15		J	17		J	19		
Cobalt	1	6.8			7.1			5.1			6.5			6.6		
Copper	2	280		J	190		J	18		J	16		J	60		
Iron	10	16000			16000			20000			20000			16000		
Lead	0.8	400			160			17			40			100		J
Magnesium	20	2700			2900			3700			3700			3200		
Manganese	1	260			270			200			220			240	L	J
Mercury	0.033	0.27			0.26			ND			ND			0.079		
Nickel	4	37			7			8.9			12			11		
Potassium	300	1300			2300			1800			2200			2700		
Selenium	1.3	1.3			ND			ND			ND			ND		
Silver	1	2.2			3.7			ND			ND			ND		
Sodium	500	1500			ND			690			1500			ND		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	24			29			34			38			32		
Zinc	2	440			81			48			58			120		J
Percent Moisture		16			23			24			21			13		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		9			9			9			10			10		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0009-B			01-VBOU3-SB-0009-C			01-VBOU3-SB-0009-D			01-VBOU3-SB-0010-A			01-VBOU3-SB-0010-B		
Parent Sample ID																
Sample Date/Time		12/12/2003 10:05			12/12/2003 10:10			12/12/2003 10:15			12/10/2003 11:01			12/10/2003 11:05		
Depth_upper (ft bgs)		5.50			8.50			23.00			0.50			2.00		
Depth_lower (ft bgs)		7.00			9.50			24.00			1.50			2.83		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	20000			30000			29000			25000			21000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	9.1			2			6.2			7.2			2.8		
Barium	1	530			42			45			660	L	J	30	L	J
Beryllium	0.5	ND			1.2			1.1			0.58			ND		
Cadmium	0.5	ND			ND			ND			57			ND		
Calcium	20	4400			6800			8000			6600			5000		
Chromium	1	8.9			19			23			11			12		
Cobalt	1	12			4.3			9.1			16			5.9		
Copper	2	4.5			22			18			12			11		
Iron	10	15000			22000			20000			24000			15000		
Lead	0.8	11		J	18		J	17		J	12			12		
Magnesium	20	4300			4900			4400			3300			3600		
Manganese	1	250	L	J	500	L	J	190	L	J	470			270		
Mercury	0.033	ND			0.036			ND			ND			ND		
Nickel	4	8.7			9.3			17			17			11		
Potassium	300	770			2300			3200			1600			1800		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			ND		
Sodium	500	1200			1600			1200			1500			1300		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	38			54			48			53			28		
Zinc	2	56		J	51		J	110		J	1200		J	48		J
Percent Moisture		15			26			18			19			22		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		10			10			12			12			13		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0010-C			01-VBOU3-SB-0010-D			01-VBOU3-SB-0012-A			01-VBOU3-SB-0012-B			01-VBOU3-SB-0013-A		
Parent Sample ID																
Sample Date/Time		12/10/2003 11:12			12/10/2003 11:25			12/19/2003 13:50			12/19/2003 13:55			12/19/2003 14:00		
Depth_upper (ft bgs)		5.00			8.00			0.25			2.00			0.00		
Depth_lower (ft bgs)		5.92			9.00			0.75			3.00			0.75		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	25000			38000			19000			24000			20000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	8.7			1.3			8.7			4.1			5.1		
Barium	1	41	L	J	63	L	J	360			290			210		
Beryllium	0.5	0.77			0.76			0.73			0.94			0.71		
Cadmium	0.5	ND			ND			8.2			4.4			6.8		
Calcium	20	5400			7900			9400			9100			6500		
Chromium	1	14			11			18			13			15		
Cobalt	1	17			5.1			9			8.4			7.5		
Copper	2	18			20			560			91			82		
Iron	10	20000			27000			19000			21000			18000		
Lead	0.8	12			18			360			36			130		
Magnesium	20	3900			4800			3200			3900			3200		
Manganese	1	380			500			420		J	350		J	340		J
Mercury	0.033	ND			ND		UJ	0.073			ND			0.055		
Nickel	4	15			8			14			12			12		
Potassium	300	2200			1800			2200			1800			1900		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			4.3			ND			ND		
Sodium	500	1600			2500			ND			ND			ND		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	40			39			34		J	36		J	34		J
Zinc	2	58		J	58		J	300			130			220		
Percent Moisture		22			25			21			20			8.5		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		13			14			14			14			15		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0013-B			01-VBOU3-SB-0014-A			01-VBOU3-SB-0014-B			01-VBOU3-SB-0014-C			01-VBOU3-SB-0015-A		
Parent Sample ID																
Sample Date/Time		12/19/2003 14:05			12/10/2003 15:55			12/10/2003 16:05			12/10/2003 16:10			12/12/2003 15:10		
Depth_upper (ft bgs)		4.50			3.00			8.08			19.00			0.25		
Depth_lower (ft bgs)		5.00			5.00			9.25			20.00			5.00		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	26000			22000			29000			27000			12000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	10		J
Arsenic	1	1.9			2			2.7			3.4			3.5		
Barium	1	110			97			120			160			620		
Beryllium	0.5	0.83			0.9			0.8			0.71			0.8		
Cadmium	0.5	ND			ND			0.64			0.66			10		
Calcium	20	14000			7100			6700			7200			12000		
Chromium	1	18			16			14			9.2			18		J
Cobalt	1	5.3			7.4			13			8.8			7.1		
Copper	2	16			17			14			7.8			210		J
Iron	10	19000			16000			25000			28000			18000		
Lead	0.8	14			13		J	11		J	12		J	280		
Magnesium	20	4900			4500			5300			4000			2500		
Manganese	1	350		J	400		J	560		J	640		J	250		
Mercury	0.033	ND			0.035			ND			ND			ND		
Nickel	4	11			14			14			7.3			12		
Potassium	300	2600			2700			1600			1300			1800		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			ND		
Sodium	500	1600			ND			1200			1900			1500		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	37		J	32			50			44			28		
Zinc	2	53			51			55			66			330		
Percent Moisture		21			20			21			20			9.4		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		15			15			16			16			16		
Sample Type		Field			Field			Field			Field			Field QC - Duplicate		
Sample ID		01-VBOU3-SB-0015-B			01-VBOU3-SB-0015-C			01-VBOU3-SB-0016-A			01-VBOU3-SB-0016-B			01-VBOU3-SB-0016-C		
Parent Sample ID														01-VBOU3-SB-0016-B		
Sample Date/Time		12/12/2003 15:15			12/12/2003 15:20			12/10/2003 14:15			12/10/2003 14:20			12/10/2003 14:20		
Depth_upper (ft bgs)		5.00			11.00			1.00			6.50			6.50		
Depth_lower (ft bgs)		8.00			12.00			2.50			9.00			9.00		
Analyte	**DL**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**
Aluminum	10	30000			29000			2000			31000			29000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	2.6			ND			1.2			22			18		
Barium	1	110			39			23	L	J	1500	L	J	1400	L	J
Beryllium	0.5	0.78			1			ND			ND		UJ	ND		
Cadmium	0.5	1.4			ND			1.1			ND			ND		
Calcium	20	8400			6800			21000			13000			15000		
Chromium	1	13		J	20		J	2.4			7.6			7.1		
Cobalt	1	6.2			5.8			2.3			12			10		
Copper	2	140		J	19		J	3600			15			13		
Iron	10	23000			21000			3300			23000			20000		
Lead	0.8	24			18			5.1			10			9.2		
Magnesium	20	5500			5100			570			4100			4000		
Manganese	1	490			440			190			380			340		
Mercury	0.033	ND			ND			ND		UJ	ND		UJ	ND		UJ
Nickel	4	22			11			ND			7.3			6.4		
Potassium	300	3000			2600			ND			1400			1300		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	1.1			ND			ND			ND			ND		
Sodium	500	ND			540			ND			2700			2400		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	32			43			7.5			45			42		
Zinc	2	140			53			37		J	54		J	46		J
Percent Moisture		24			22			7.2			18			19		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		16			17			17			17			17		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0016-D			01-VBOU3-SB-0017-A			01-VBOU3-SB-0017-B			01-VBOU3-SB-0017-C			01-VBOU3-SB-0017-D		
Parent Sample ID																
Sample Date/Time		12/10/2003 14:30			12/11/2003 10:40			12/11/2003 10:44			12/11/2003 10:50			12/11/2003 11:00		
Depth_upper (ft bgs)		10.00			0.25			5.00			9.25			11.00		
Depth_lower (ft bgs)		11.08			3.00			6.08			10.50			12.50		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	28000			4400			28000			33000			7000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	1.1			2.5			2			5.7			ND		
Barium	1	54	L	J	110			1200			1100			16		
Beryllium	0.5	0.78			ND			ND			0.74			ND		
Cadmium	0.5	ND			ND			0.77			0.86			ND		
Calcium	20	6100			6600			18000			10000			9000		
Chromium	1	20			3.4			6			10			5		
Cobalt	1	7.2			3			11			22			1.6		
Copper	2	20			83			4.8			12			5.8		
Iron	10	20000			4900			27000			24000			5300		
Lead	0.8	15			43		J	7.2		J	16		J	3.4		J
Magnesium	20	4800			550			7400			5700			1300		
Manganese	1	320			120		J	850		J	530		J	86		J
Mercury	0.033	0.033		J	0.13			ND			ND			ND		
Nickel	4	13			ND			4.1			10			ND		
Potassium	300	3200			340			790			1900			880		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			1			ND			ND			ND		
Sodium	500	1900			ND			1300			2000			ND		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	45			11			56			54			11		
Zinc	2	66		J	30			55			58			14		
Percent Moisture		21			18			18			17			19		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		18			18			18			18			19		
Sample Type		Field			Field			Field			Field QC - Duplicate			Field		
Sample ID		01-VBOU3-SB-0018-A			01-VBOU3-SB-0018-B			01-VBOU3-SB-0018-C			01-VBOU3-SB-0018-D			01-VBOU3-SB-0019-A		
Parent Sample ID											01-VBOU3-SB-0018-C					
Sample Date/Time		12/11/2003 13:00			12/11/2003 13:10			12/11/2003 13:14			12/11/2003 13:16			12/10/2003 12:35		
Depth_upper (ft bgs)		2.00			5.00			6.00			6.00			8.00		
Depth_lower (ft bgs)		5.00			6.00			8.00			8.00			9.08		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	10000			39000			37000			36000			23000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	2.6			3.6			3			2.5			1.2		
Barium	1	100			1200			1200			1300			44	L	J
Beryllium	0.5	ND			ND			ND			ND			0.52		
Cadmium	0.5	ND			1.3			0.69			0.84			ND		
Calcium	20	3200			43000			15000			15000			4500		
Chromium	1	11			7.2			5.9			7.3			14		
Cobalt	1	4.8			14			13			14			5.7		
Copper	2	130			9.2			5.2			4.6			14		
Iron	10	12000			31000			30000			33000			21000		
Lead	0.8	44		J	12		J	7.8		J	7.5		J	11		
Magnesium	20	1800			9300			8800			8500			3700		
Manganese	1	170		J	1900		J	1000		J	1000		J	410		
Mercury	0.033	ND			ND			ND			ND			0.033		J
Nickel	4	6.6			6.8			4.7			4.8			15		
Potassium	300	1900			1000			790			790			2500		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			ND		
Sodium	500	ND			910			1300			1400			2200		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	22			61			59			73			34		
Zinc	2	36			55			60			66			45		J
Percent Moisture		13			20			18			19			18		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		19			20			20			21			21		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0019-B			01-VBOU3-SB-0020-A			01-VBOU3-SB-0020-B			01-VBOU3-SB-0021-A			01-VBOU3-SB-0021-B		
Parent Sample ID																
Sample Date/Time		12/10/2003 12:45			12/10/2003 15:20			12/10/2003 15:25			12/11/2003 11:40			12/11/2003 11:48		
Depth_upper (ft bgs)		11.00			2.00			8.75			0.50			4.50		
Depth_lower (ft bgs)		11.83			3.00			10.00			2.00			5.50		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	21000			33000			32000			12000			25000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	1.1			1.6			27			23			1.9		
Barium	1	42	L	J	340			940			190			45		
Beryllium	*0.5*	*0.57*			*0.62*			*0.91*			ND			*0.65*		
Cadmium	0.5	ND			0.64			1.4			9.3			ND		
Calcium	20	5000			11000			10000			7000			13000		
Chromium	1	15			5.5			13			14			17		
Cobalt	1	5.3			9.8			61			5.3			4.4		
Copper	2	18			6.7			13			270			15		
Iron	10	14000			27000			38000			14000			16000		
Lead	0.8	22			7.3		J	18		J	210		J	15		J
Magnesium	20	3700			8400			5400			3400			3700		
Manganese	1	440			890		J	1100		J	340		J	140		J
Mercury	0.033	ND		UJ	ND			ND			1.6			ND		
Nickel	4	13			5			42			8			8.3		
Potassium	300	2500			720			2100			2400			2100		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			3			ND		
Sodium	500	2000			840			3300			ND			ND		
Thallium	1.2	ND			ND			1.2			ND			ND		
Vanadium	2	31			57			59			24			41		
Zinc	2	50		J	56			67			470			40		
Percent Moisture		19			20			16			12			20		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory.
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		21			22			22			22			22		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0021-C			01-VBOU3-SB-0022-A			01-VBOU3-SB-0022-B			01-VBOU3-SB-0022-C			01-VBOU3-SB-0022-D		
Parent Sample ID																
Sample Date/Time		12/11/2003 11:52			12/12/2003 9:05			12/12/2003 9:10			12/12/2003 9:15			12/12/2003 9:25		
Depth_upper (ft bgs)		8.00			2.00			6.00			10.50			21.00		
Depth_lower (ft bgs)		9.00			4.00			8.50			12.00			23.00		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	27000			5300			24000			28000			26000		
Antimony	1	ND		UJ	2		J	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	ND			51			15			1.5			47		
Barium	1	41			270			1200			50			38		J
Beryllium	0.5	0.59			ND			ND			0.79			1.1		
Cadmium	0.5	ND			11			1.8			ND			ND		
Calcium	20	15000			15000			13000			6700			9100		
Chromium	1	16			6.3			7.3			21			12		
Cobalt	1	3.9			3.5			10			6.7			7.9		
Copper	2	15			580			210			19			34		
Iron	10	19000			7800			19000			19000			23000		
Lead	0.8	13		J	380		J	140		J	15		J	16		J
Magnesium	20	3400			4900			5500			5300			4100		
Manganese	1	190		J	280	L	J	570	L	J	380	L	J	110		J
Mercury	0.033	ND			0.19			0.047			0.033			ND		
Nickel	4	8.1			4.7			6.8			14			9.4		
Potassium	300	2400			1400			1500			3300			1600		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			13			2.5			ND			ND		
Sodium	500	ND			ND			740			650			1800		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	36			19			46			48			40		
Zinc	2	41			410		J	110		J	72		J	110		
Percent Moisture		18			8.3			17			21			29		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		22			23			23			23			24		
Sample Type		Field QC - PE Std			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0022-E			01-VBOU3-SB-0023-A			01-VBOU3-SB-0023-B			01-VBOU3-SB-0023-C			01-VBOU3-SB-0024-A		
Parent Sample ID		1-2														
Sample Date/Time		12/18/2003 11:42			12/19/2003 10:10			12/19/2003 10:15			12/19/2003 10:20			12/19/2003 8:40		
Depth_upper (ft bgs)					0.08			2.00			10.00			0.50		
Depth_lower (ft bgs)					1.50			5.00			10.67			3.00		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	2400			17000			30000			28000			27000		
Antimony	1	3.3		J	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	140			3.5			3			5.7			53		
Barium	1	370			83			64			32			700		
Beryllium	0.5	ND			ND			0.95			1			ND		
Cadmium	0.5	2.1			ND			ND			ND			ND	G	
Calcium	20	38000			6600			7300			7800			12000		
Chromium	1	7.8			13		J	19		J	13		J	8.7		J
Cobalt	1	15			5.6			7.7			6.2			12		
Copper	2	1400			30			20			18			18		
Iron	10	4800			17000			23000			21000			28000		
Lead	0.8	1400		J	35			21			15			10		
Magnesium	20	16000			3000			3800			3200			4900		
Manganese	1	770	L	J	270			410			120			700		
Mercury	0.033	0.24			ND			ND			ND			ND		
Nickel	4	10			9.9			13			10			6.5		
Potassium	300	800			2000			2500			1700			1500		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			ND		
Sodium	500	ND			520		J	1300		J	1100		J	2200		J
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	270			30		J	45		J	34		J	55		J
Zinc	2	1700		J	93		J	71		J	67		J	80		J
Percent Moisture		0.48			9			19			21			17		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		24			24			24			25			25		
Sample Type		Field Duplicate			Field QC - PE Std			Field			Field			Field		
Sample ID		**01-VBOU3-SB-0024-B**			**01-VBOU3-SB-0024-C**			**01-VBOU3-SB-0024-D**			**01-VBOU3-SB-0025-A**			**01-VBOU3-SB-0025-B**		
Parent Sample ID		01-VBOU3-SB-0024-A			1-9											
Sample Date/Time		12/19/2003 8:40			12/19/2003 8:45			12/19/2003 8:50			12/19/2003 9:15			12/19/2003 9:20		
Depth_upper (ft bgs)		0.50						6.50			0.17			5.50		
Depth_lower (ft bgs)		3.00						7.50			1.50			6.00		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	24000			2300			32000			32000			27000		
Antimony	1	ND		UJ	2.7		J	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	32			130			13			1.9			2		
Barium	1	650			360			1100			740			160		
Beryllium	0.5	0.53			ND			0.83			ND			ND		
Cadmium	0.5	ND	G		1.9			ND	G		ND	G		ND		
Calcium	20	10000			40000			12000			21000			80000		
Chromium	1	7.7		J	7.6		J	8		J	5.9		J	6.5		J
Cobalt	1	12			12			14			12			13		
Copper	2	13			1300			12			4.7			3.2		
Iron	10	25000			4800			27000			34000			32000		
Lead	0.8	9.5			1400			14			7.6			6.5		
Magnesium	20	4300			16000			4100			8300			7300		
Manganese	1	740			810			370			820			3600		
Mercury	0.033	ND			0.22			ND			ND			ND		
Nickel	4	5.8			9.7			5.2			4			4.9		
Potassium	300	1300			730			1600			720			500		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			ND		
Sodium	500	1900		J	ND			5100		J	3300		J	1700		J
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	52		J	260		J	61		J	66		J	66		J
Zinc	2	65		J	1900		J	73		J	76		J	68		J
Percent Moisture		18			0.34			17			18			12		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		26			26			26			27			27		
Sample Type		Field			Field			Field Duplicate			Field			Field		
Sample ID		01-VBOU3-SB-0026-A			01-VBOU3-SB-0026-B			01-VBOU3-SB-0026-C			01-VBOU3-SB-0027-A			01-VBOU3-SB-0027-B		
Parent Sample ID								01-VBOU3-SB-0026-B								
Sample Date/Time		12/19/2003 12:30			12/19/2003 12:35			12/19/2003 12:35			12/11/2003 15:07			12/11/2003 15:11		
Depth_upper (ft bgs)		0.25			3.00			3.00			0.17			5.00		
Depth_lower (ft bgs)		2.83			4.50			4.50			3.00			9.00		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	9100			25000			24000			24000			28000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	3.4			4.1			3.6			4.4			10		
Barium	1	79			110			78			120			280		
Beryllium	0.5	ND			1			1			ND			0.75		
Cadmium	0.5	0.67			ND			ND			ND			ND		
Calcium	20	4100			7000			7200			5100			14000		
Chromium	1	16			13			11			16			13		
Cobalt	1	5.8			7.1			7.5			7.6			12		
Copper	2	23			19			17			20			66		
Iron	10	14000			24000			24000			21000			27000		
Lead	0.8	23			50			22			19		J	40		J
Magnesium	20	3100			3700			3300			3400			4800		
Manganese	1	220		J	520		J	760		J	300	L	J	650	L	J
Mercury	0.033	ND			0.039			0.046			ND			0.077		
Nickel	4	16			9.1			9.1			10			13		
Potassium	300	1800			2100			1500			3200			2300		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			1.1		
Sodium	500	ND			790			830			660			1000		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	33		J	35		J	36		J	44			54		
Zinc	2	69			87			70			62		J	130		J
Percent Moisture		3.3			18			22			12			16		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		27			27			27			28			28		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0027-C			01-VBOU3-SB-0027-D			01-VBOU3-SB-0027-E			01-VBOU3-SB-0028-A			01-VBOU3-SB-0028-B		
Parent Sample ID																
Sample Date/Time		12/11/2003 15:30			12/11/2003 15:45			12/11/2003 16:05			12/10/2003 8:30			12/10/2003 8:35		
Depth_upper (ft bgs)		13.00			17.00			20.33			0.92			10.00		
Depth_lower (ft bgs)		14.17			18.00			21.00			1.92			10.50		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	36000			30000			29000			30000			25000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	2.9			10			1.9			2.4			4.9		
Barium	1	1100			1100			84			36	L	J	210	L	J
Beryllium	0.5	0.76			0.75			0.84			0.76			ND		
Cadmium	0.5	ND			ND			ND			ND			ND		
Calcium	20	9600			9800			7100			5500			8200		
Chromium	1	9.9			9.4			22			14			29		
Cobalt	1	10			14			5.2			5.1			11		
Copper	2	12			15			24			11			7.5		
Iron	10	29000			27000			21000			21000			33000		
Lead	0.8	9.2		J	11		J	16		J	12			9.1		
Magnesium	20	5500			4100			4800			4400			3800		
Manganese	1	420	L	J	380	L	J	640	L	J	320			490		
Mercury	0.033	ND			ND			ND			ND			ND		
Nickel	4	4.5			5.9			16			8.4			9.8		
Potassium	300	1800			1900			3800			2000			1300		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			ND		
Sodium	500	1800			2800			1100			1800			1700		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	60			73			50			37			57		
Zinc	2	64		J	67		J	63		J	49		J	65		J
Percent Moisture		22			20			19			22			18		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		28			28			28			29			29		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0028-C			01-VBOU3-SB-0028-D			01-VBOU3-SB-0028-E			01-VBOU3-SB-0029-A			01-VBOU3-SB-0029-B		
Parent Sample ID																
Sample Date/Time		12/10/2003 8:40			12/10/2003 8:50			12/10/2003 9:05			12/10/2003 9:50			12/10/2003 9:55		
Depth_upper (ft bgs)		14.00			19.00			24.00			1.83			5.00		
Depth_lower (ft bgs)		15.00			20.00			25.50			2.83			5.50		
Analyte	**DL**	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	27000			27000			31000			38000			32000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	5.3			1.9			2.3			ND			ND		
Barium	1	32	L	J	38	L	J	30	L	J	49	L	J	35	L	J
Beryllium	0.5	1.1			0.7			0.6			1			0.75		
Cadmium	0.5	ND			ND			ND			ND			ND		
Calcium	20	7000			6300			7400			8700			7000		
Chromium	1	15			21			18			17			20		
Cobalt	1	4.5			5.6			4.3			11			7.2		
Copper	2	22			17			20			11			22		
Iron	10	16000			17000			19000			31000			25000		
Lead	0.8	19			16			11			15			14		
Magnesium	20	3300			4000			3100			4600			3900		
Manganese	1	97			110			120			290			220		
Mercury	0.033	0.039			ND			0.39			ND			ND		
Nickel	4	9.3			13			8.8			15			15		
Potassium	300	2300			3000			2400			2300			2500		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			ND		
Sodium	500	1500			1300			1500			1700			1400		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	37			47			42			42			44		
Zinc	2	65		J	58		J	52		J	68		J	57		J
Percent Moisture		21			17			16			21			18		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

<u>Qualifiers:</u>
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present.
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		29			29			29			30			30		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0029-C			01-VBOU3-SB-0029-D			01-VBOU3-SB-0029-E			01-VBOU3-SB-0030-A			01-VBOU3-SB-0030-B		
Parent Sample ID																
Sample Date/Time		12/10/2003 10:05			12/10/2003 10:10			12/10/2003 10:15			12/11/2003 14:10			12/11/2003 14:17		
Depth_upper (ft bgs)		11.00			15.50			20.00			0.00			1.00		
Depth_lower (ft bgs)		11.92			16.33			21.00			0.50			3.00		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	31000			28000			26000			23000			33000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	ND			1.1			1.5			2.8			1.3		
Barium	1	35	L	J	29	L	J	41	L	J	86			51		
Beryllium	0.5	1.1			0.53			0.57			0.65			0.85		
Cadmium	0.5	ND			ND			ND			ND			ND		
Calcium	20	6800			6600			7000			10000			11000		
Chromium	1	17			12			19			15			22		
Cobalt	1	5.9			6			8.5			6.3			12		
Copper	2	19			12			24			65			13		
Iron	10	21000			20000			20000			18000			23000		
Lead	0.8	21			13			27			22		J	15		J
Magnesium	20	3300			3100			3600			3900			5600		
Manganese	1	240			200			430			260		J	370	L	J
Mercury	0.033	ND			ND			0.081			ND			ND		
Nickel	4	12			11			21			10			15		
Potassium	300	2100			2000			2800			2400			3200		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			ND		
Sodium	500	1500			1300			1200			720			2900		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	49			32			45			34			58		
Zinc	2	55		J	50		J	77		J	55			53		J
Percent Moisture		20			18			15			14			15		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		30			31			31			31			32		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0030-C			01-VBOU3-SB-0031-A			01-VBOU3-SB-0031-B			01-VBOU3-SB-0031-C			01-VBOU3-SB-0032-A		
Parent Sample ID																
Sample Date/Time		12/11/2003 14:27			12/11/2003 8:45			12/11/2003 8:50			12/11/2003 9:00			12/12/2003 8:05		
Depth_upper (ft bgs)		9.00			0.83			5.00			10.00			0.33		
Depth_lower (ft bgs)		10.50			2.00			6.17			11.00			2.50		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	21000			33000			31000			35000			25000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	3.1			1.2			ND			ND			13		
Barium	1	1200			64			33			25			210		
Beryllium	0.5	ND			1.1			1.1			1			0.55		
Cadmium	0.5	ND			0.78			0.57			0.74			1.1		
Calcium	20	5500			7000			6900			8200			14000		
Chromium	1	10			16			16			18			17		
Cobalt	1	6.6			6.7			5.5			6.4			7.6		
Copper	2	4			26			15			12			150		
Iron	10	10000			25000			21000			26000			19000		
Lead	0.8	6.4		J	17		J	14		J	10		J	110		J
Magnesium	20	2000			5100			4100			4100			4100		
Manganese	1	190	L	J	310		J	280		J	270		J	330	L	J
Mercury	0.033	ND			ND			ND			ND			0.069		
Nickel	4	5.9			9.8			8.8			12			11		
Potassium	300	1300			2600			1700			2400			2600		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			1.4		
Sodium	500	5500			2300			2300			2100			1100		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	29			45			35			44			44		
Zinc	2	37		J	56			39			53			130		J
Percent Moisture		12			24			24			20			21		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		32			32			32			32			33		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0032-B			01-VBOU3-SB-0032-C			01-VBOU3-SB-0032-D			01-VBOU3-SB-0032-E			01-VBOU3-SB-0033-A		
Parent Sample ID																
Sample Date/Time		12/12/2003 8:10			12/12/2003 8:15			12/12/2003 8:20			12/12/2003 8:25			12/18/2003 14:15		
Depth_upper (ft bgs)		6.00			9.00			13.83			24.00			0.33		
Depth_lower (ft bgs)		8.50			10.50			15.00			25.00			2.50		
Analyte	**DL**	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	22000			32000			45000			31000			20000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	7.7			1			ND			3.5			5.5		
Barium	1	280			49			51			37			200		
Beryllium	0.5	ND			0.78			1			1			0.51		
Cadmium	0.5	ND			ND			ND			ND			ND		
Calcium	20	11000			9600			9500			6500			8000		
Chromium	1	19			23			17			21			13		J
Cobalt	1	6.7			7.5			7.3			6.5			7.5		
Copper	2	45			24			17			18			18		
Iron	10	32000			22000			32000			22000			17000		
Lead	0.8	230		J	21		J	24		J	18		J	21		
Magnesium	20	4100			4500			4700			4100			3500		
Manganese	1	320	L	J	240	L	J	370	L	J	150	L	J	240		
Mercury	0.033	0.24			ND			0.046			ND			ND		
Nickel	4	15			12			13			14			8.5		
Potassium	300	2700			3000			2500			3000			1900		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			ND		
Sodium	500	1800			1800			2100			1800			530		J
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	42			54			50			45			32		J
Zinc	2	130		J	58		J	77		J	75		J	65		J
Percent Moisture		24			23			22			19			17		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		33			33			33			33			34		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0033-B			01-VBOU3-SB-0033-C			01-VBOU3-SB-0033-D			01-VBOU3-SB-0033-E			01-VBOU3-SB-0034-A		
Parent Sample ID																
Sample Date/Time		12/18/2003 14:20			12/18/2003 14:25			12/18/2003 14:30			12/18/2003 14:35			12/18/2003 13:30		
Depth_upper (ft bgs)		3.00			9.00			15.67			18.00			0.33		
Depth_lower (ft bgs)		4.00			10.00			16.50			18.50			2.33		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	13000			5100			1400			23000			23000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	2.9			1.8			ND			6.7			8.8		
Barium	1	100			55			11			36			430		J
Beryllium	0.5	ND			ND			ND			0.94			0.59		
Cadmium	0.5	ND	G		ND			0.88			ND			ND		
Calcium	20	2700			2500			600			6300			9800		
Chromium	1	16		J	13		J	2.2		J	13		J	13		
Cobalt	1	6.4			4			ND			18			21		
Copper	2	8.1			6			7.5			14			12		
Iron	10	17000			12000			3300			17000			18000		
Lead	0.8	12			9.3			1.7		U	18			19		J
Magnesium	20	3100			1700			330			3700			3800		
Manganese	1	300			160			30			160			770		J
Mercury	0.033	ND			ND			ND			ND			ND		
Nickel	4	8.6			5.8			ND			21			15		
Potassium	300	2800			1200			330		U	1900			1300		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			ND		
Sodium	500	ND			ND			ND			720		J	1000		
Thallium	1.2	ND			ND			ND			ND			1.2		
Vanadium	2	31		J	23		J	4.6		J	29		J	40		
Zinc	2	55		J	33		J	25		J	67		J	62		
Percent Moisture		8.1			3.5			3			21			15		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		34			34			34			34			34		
Sample Type		Field			Field			Field Duplicate			Field			Field		
Sample ID		01-VBOU3-SB-0034-B			01-VBOU3-SB-0034-C			01-VBOU3-SB-0034-D			01-VBOU3-SB-0034-E			01-VBOU3-SB-0034-F		
Parent Sample ID								01-VBOU3-SB-0034-C								
Sample Date/Time		12/18/2003 13:35			12/18/2003 13:40			12/18/2003 13:40			12/18/2003 13:45			12/18/2003 13:50		
Depth_upper (ft bgs)		4.50			11.00			11.00			18.00			21.00		
Depth_lower (ft bgs)		6.50			13.00			13.00			19.50			22.00		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	25000			8000			7200			8400			28000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	9.2			2.6			2.3			1.2			4.8		
Barium	1	250		J	73		J	67		J	670		J	51		J
Beryllium	0.5	0.65			ND			ND			ND			0.88		
Cadmium	0.5	ND			ND			ND			ND			ND		
Calcium	20	8700			3600			3200			2800			6400		
Chromium	1	14			16			15			6			11		
Cobalt	1	8.4			6			5.5			2.7			7.5		
Copper	2	8.3			7.3			7.5			4.1			12		
Iron	10	20000			16000			15000			7900			24000		
Lead	0.8	12		J	12		J	10		J	4.1		J	12		J
Magnesium	20	4500			2400			2200			1300			4400		
Manganese	1	270		J	250		J	220		J	92		J	340		J
Mercury	0.033	ND			ND			ND			ND			ND		
Nickel	4	7			8.2			7.6			ND			9.1		
Potassium	300	1300			2100			1900			1000			1700		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			ND		
Sodium	500	2000			ND			ND			840			910		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	55			27			25			16			29		
Zinc	2	58			41			38			22			71		
Percent Moisture		11			3.6			3.9			3			18		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		35			35			35			36			36		
Sample Type		Field			Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0035-A			01-VBOU3-SB-0035-B			01-VBOU3-SB-0035-C			01-VBOU3-SB-0036-A			01-VBOU3-SB-0036-B		
Parent Sample ID																
Sample Date/Time		12/18/2003 15:50			12/18/2003 15:55			12/18/2003 16:00			12/19/2003 11:50			12/19/2003 11:55		
Depth_upper (ft bgs)		0.50			9.00			9.83			0.25			5.00		
Depth_lower (ft bgs)		3.50			9.67			10.83			3.50			10.00		
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	8300			3300			18000			15000			13000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	2.6			1			1.3			5.7			2.5		
Barium	1	86			36			23			130			97		
Beryllium	0.5	ND			ND			0.54			0.56			ND		
Cadmium	0.5	ND			0.91			ND			ND			10		
Calcium	20	5000			1300			7200			3300			3700		
Chromium	1	12		J	4.5		J	9.1		J	14			13		
Cobalt	1	4.8			2.2			3.7			5.8			5.6		
Copper	2	9			2.8			11			24			10		
Iron	10	11000			5400			13000			15000			14000		
Lead	0.8	11			3.3			20			21			13		
Magnesium	20	1900			760			2500			2700			2400		
Manganese	1	190			150			200			240		J	290		J
Mercury	0.033	ND			ND			ND			ND			ND		
Nickel	4	6.4			4.9			7.2			8.1			8.8		
Potassium	300	2200			860			1200			2700			2000		
Selenium	1.3	ND			ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND			ND		
Sodium	500	ND			ND			ND			ND			ND		
Thallium	1.2	ND			ND			ND			ND			ND		
Vanadium	2	22		J	8.9		J	25		J	30		J	26		J
Zinc	2	70		J	55		J	73		J	69			350		
Percent Moisture		9.5			2.4			15			9.2			6.2		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

Table C-1.
Soil Sampling Results (mg/kg)

Station		36			37			37			37		
Sample Type		Field			Field			Field			Field		
Sample ID		01-VBOU3-SB-0036-C			01-VBOU3-SB-0037-A			01-VBOU3-SB-0037-B			01-VBOU3-SB-0037-C		
Parent Sample ID													
Sample Date/Time		12/19/2003 12:00			12/18/2003 15:15			12/18/2003 15:20			12/18/2003 15:25		
Depth_upper (ft bgs)		11.00			0.00			5.83			10.00		
Depth_lower (ft bgs)		12.00			1.00			7.00			11.17		
Analyte	**DL**	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	24000			17000			23000			22000		
Antimony	1	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	1	1.2			6.1			2.6			2.9		
Barium	1	33			160			56			19		
Beryllium	0.5	0.85			0.9			0.86			0.53		
Cadmium	0.5	ND			2.7			0.59			ND		
Calcium	20	8500			4400			9800			14000		
Chromium	1	13			13		J	18		J	10		J
Cobalt	1	2.4			6.8			6			4.6		
Copper	2	26			23			21			4.3		
Iron	10	17000			18000			18000			15000		
Lead	0.8	19			30			16			12		
Magnesium	20	3300			3300			4400			2600		
Manganese	1	240		J	410			150			160		
Mercury	0.033	0.066			ND			0.1			ND		
Nickel	4	7.1			9.2			16			7		
Potassium	300	2000			2600			2200			910		
Selenium	1.3	ND			ND			ND			ND		
Silver	1	ND			ND			ND			ND		
Sodium	500	ND			ND			960		J	720		J
Thallium	1.2	ND			ND			ND			ND		
Vanadium	2	30		J	31		J	34		J	24		J
Zinc	2	50			130		J	100		J	41		J
Percent Moisture		18			9.7			16			16		

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
G = Elevated reporting limit, due to matrix interferences (for cadmium in soil, elevated detection limit ranged from 1.1 to 1.4)
J = Result is an estimated quantity
L = Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present
U = Undetected, result is less than the detection limit

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ANALYTICAL RESULTS FOR GROUNDWATER

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Table C-2a.
Groundwater Sampling Results
Total Metals (ug/L)

Station		4			7			4		
Sample Type		Field			Field			Field QC - PE Standard		
Sample ID		01-VBOU3-GW-0003			01-VBOU3-GW-0002			01-VBOU3-GW-0005		
Parent Sample ID								7-A		
Sample Date/Time		12-18-2003			12-12-2003			12-18-2003		
Depth_upper (ft bgs)		11.0			12.2					
Depth_lower (ft bgs)										
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	10	27200			355000			ND	U	
Antimony	4	ND	U		40.1			138		
Arsenic	1	12.2	B	J	11600		J	41.4		J
Barium	1	414			1410			637		
Beryllium	0.5	ND	U	UJ	26.1		J	22.1		J
Cadmium	0.5	908		J	7400		J	24.8		J
Calcium	20	360120			736800			90		U
Chromium	4	ND	U		460			ND	U	
Cobalt	1	31.6			199			183		
Copper	4	153			37500			6.43	B	
Iron	50	25700			1100000			283		
Lead	0.3	42.6		J	15800		J	19.1		J
Magnesium	150	53000			148000			13600		
Manganese	5	5690			22800			89.4		U
Mercury	0.06	0.099	B	U	17.7			ND	U	
Nickel	2	56.2			889			6.3	B	U
Potassium	200	11200			92200			17600		
Selenium	1	11	B	J	39.4		J	83.4		J
Silver	0.2	2.19	B	J	219		J	35.2		J
Sodium	100	900000			833000			100	B	J
Thallium	0.1	4.68		J	300		J	30		J
Vanadium	3	47.4	B	J	541		J	ND	U	
Zinc	2	11200			85200			130		
pH		4.6			5.1					
Hardness (mg/L)		1112.5			2447.3			57.1		
Specific Conductance (umhos/cm)										
Conductivity (uS/cm)		2.17			1.52					
Total Dissolved Solids (mg/L)										
Temperature (°F)		41			58.9					

DL = Detection Limit
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation
ND = Non-detect

Qualifiers:
B = Concentration qualifier, above reporting limit, less than PQL
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit

Table C-2a.
Groundwater Sampling Results
Total Metals (ug/L)

Station		32			32			33			33			
Sample Type		Field			Field			Field			Field			
Sample ID		MW-32-070104			MW-32-072804			MW-33-050304			MW-33-052104			
Parent Sample ID														
Sample Date/Time		7/1/2004 10:40:00 AM			7/28/2004 10:00:00 AM			5/3/2004 3:20:00 PM			5/21/2004 9:30:00 AM			
Depth_upper (ft bgs)		6.1			3.9			16.1			15.6			
Depth_lower (ft bgs)														
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	
Aluminum	20	440			170			26000			580		J	
Antimony	0.15	ND			ND			ND		UJ	ND			
Arsenic	0.12	2.3			2.7			7.1			1.9		J	
Barium	0.37	48			44			220			29			
Beryllium	0.061	ND			ND			1.6			ND			
Cadmium	0.051	ND			13			87			27			
Calcium	76	230000			140000			77000			66000			
Chromium	2.1	ND			ND			26			ND			
Cobalt	0.67	ND			19			64			ND			
Copper	0.97	17			ND			96			ND			
Iron	19	320			3000			28000			560			
Lead	2.1	ND			ND			26			ND			
Magnesium	27	29000			18000			11000			6700			
Manganese	0.54	79			650			1300			51			
Mercury	0.025	ND			ND			ND			ND			
Nickel	4.2	ND			ND			46			ND			
Potassium	460	ND			ND			6500			ND			
Selenium	4.6	ND			ND			ND			ND			
Silver	0.7	ND			ND			ND			ND			
Sodium	1100	640000			440000			100000			82000			
Thallium	0.047	ND			ND			ND			ND			
Vanadium	2.6	ND			ND			38			ND			
Zinc	7.1	ND			ND			940			190			
pH								6.5			6.5			
Hardness (mg/L)														
Specific Conductance (umhos/cm)								780			800			
Conductivity (uS/cm)														
Total Dissolved Solids (mg/L)														
Temperature														

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation
ND = Non-detect

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit

Table C-2a.
Groundwater Sampling Results
Total Metals (ug/L)

Station		33			33			34			34		
Sample Type		Field			Field			Field			Field		
Sample ID		MW-33-070104			MW-33-072804			MW-34-052104			MW-34-070104		
Parent Sample ID													
Sample Date/Time		7/1/2004 8:50:00 AM			7/28/2004 8:50:00 AM			5/21/2004 10:25:00 AM			7/1/2004 9:55:00 AM		
Depth_upper (ft bgs)		15.6			15.7			21.1			20		
Depth_lower (ft bgs)													
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	20	420			110			260		J	ND		
Antimony	0.15	ND			ND			ND			ND		
Arsenic	0.12	3.1			2.2			ND			ND		
Barium	0.37	30			34			65			63		
Beryllium	0.061	ND			ND			ND			ND		
Cadmium	0.051	27			33			7.5		J	3.5		
Calcium	76	75000			100000			610000			670000		
Chromium	2.1	ND			ND			ND			ND		
Cobalt	0.67	ND			ND			ND			ND		
Copper	0.97	ND			ND			14			ND		
Iron	19	330			170			1100			160		
Lead	2.1	ND			ND			ND			ND		
Magnesium	27	7300			9800			54000			75000		
Manganese	0.54	32			23			840			140		
Mercury	0.025	ND			ND			ND			ND		
Nickel	4.2	ND			ND			ND			ND		
Potassium	460	ND			ND			13000			11000		
Selenium	4.6	ND			ND			ND			ND		
Silver	0.7	ND			ND			ND		UJ	ND		
Sodium	1100	93000			120000			670000			720000		
Thallium	0.047	ND			ND			ND			ND		
Vanadium	2.6	ND			ND			ND		UJ	ND		
Zinc	7.1	220			250			65			76		
pH		6.6			6.6								
Hardness (mg/L)													
Specific Conductance (umhos/cm)		840			1000								
Conductivity (uS/cm)													
Total Dissolved Solids (mg/L)													
Temperature													

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation
ND = Non-detect

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit

Table C-2a.
Groundwater Sampling Results
Total Metals (ug/L)

Station		34			36			30		
Sample Type		Field			Field			Field QC - PE Standard		
Sample ID		MW-34-072804			MW-36-052104			MW-30-070104		
Parent Sample ID								7-B		
Sample Date/Time		7/28/2004 9:15:00 AM			5/21/2004 11:05:00 AM			7/1/2004 12:05:00 PM		
Depth_upper (ft bgs)		19.8			8.3					
Depth_lower (ft bgs)										
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	20	390			1300		J	ND		
Antimony	0.15	ND			ND			130		
Arsenic	0.12	1.3			10		J	40		
Barium	0.37	36			100			630		
Beryllium	0.061	ND			ND			23		
Cadmium	0.051	17			41			24		
Calcium	76	300000			480000			ND		
Chromium	2.1	ND			ND			ND		
Cobalt	0.67	ND			ND			180		
Copper	0.97	ND			46			ND		
Iron	19	700			1500			320		
Lead	2.1	ND			7.2			18		
Magnesium	27	36000			60000			13000		
Manganese	0.54	45			1600			86		
Mercury	0.025	ND			ND			ND		
Nickel	4.2	ND			ND			ND		
Potassium	460	6600			11000			17000		
Selenium	4.6	ND			ND			75		
Silver	0.7	ND			ND			36		
Sodium	1100	470000			430000			ND		
Thallium	0.047	ND			ND			29		
Vanadium	2.6	ND			ND			ND		
Zinc	7.1	ND			200			170		
pH										
Hardness (mg/L)										
Specific Conductance (umhos/cm)										
Conductivity (uS/cm)										
Total Dissolved Solids (mg/L)										
Temperature										

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation
ND = Non-detect

Qualifiers:
J = Result is an estimated quantity
U = Undetected. result is less than the detection limit

Table C-2a.
Groundwater Sampling Results
Total Metals (ug/L)

Station		GW-15			GW-16			GW-17			GW-46			30		
Sample Type		Field			Field			Field			Field			Field QC - PE Standard		
Sample ID		KP-GW-15-111904			KP-GW-16-111904			KP-GW-17-111904			KP-GW-46-111904			MW-30-050205		
Parent Sample ID																
Sample Date/Time		11/19/2004 11:35			11/19/2004 10:15			11/19/2004 12:45			11/19/2004 14:00			5/2/2005 13:05		
Depth_upper (ft bgs)		15.45			9.02			15.57			9.7					
Depth_lower (ft bgs)																
Analyte	DL															
Aluminum	20	ND			220		J	3500		J	ND			190		
Antimony	0.15	ND			ND			ND			ND			34	J	J
Arsenic	0.12	ND			ND			3.3			ND			11	J	J
Barium	0.37	120			74			200			80			120		
Beryllium	0.061	ND			ND			ND			ND			6.2	J	J
Cadmium	0.051	110			53			8			24			6		
Calcium	76	210000			230000			120000			200000			ND		
Chromium	2.1	ND			ND			ND			ND			ND		
Cobalt	0.67	ND			ND			11			ND			53		
Copper	0.97	ND			ND			30			ND			ND		
Iron	19	100			240			11000			ND			ND		
Lead	2.1	ND			ND			12			ND			ND		
Magnesium	27	35000			36000			14000			30000			2200		
Manganese	0.54	40			490			18000			11			27		
Mercury	0.025	ND			ND			0.22			ND			ND		
Nickel	4.2	ND			ND			42			ND			ND		
Potassium	460	9100			7800			3200			6700			ND		
Selenium	4.6	ND			ND			ND			ND			22		
Silver	0.7	ND			ND			ND			ND			ND		
Sodium	1100	250000			250000			170000			250000			ND		
Thallium	0.047	ND			ND			ND			ND			5.4		
Vanadium	2.6	ND			ND			12			ND			ND		
Zinc	7.1	120		J	150		J	61		J	170		J	30		
pH																
Hardness (mg/L)																
Specific Conductance (umhos/cm)																
Conductivity (uS/cm)																
Total Dissolved Solids (mg/L)																
Temperature																

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation
ND = Non-detect

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit

Table C-2a.
Groundwater Sampling Results
Total Metals (ug/L)

Station		30			PS-1			PS-3			PS-4		
Sample Type		Field QC - PE Standard			Field			Field			Field		
Sample ID		MW-30-111904			PS-1-050205			PS-3-050205			PS-4-050205		
Parent Sample ID		7-B											
Sample Date/Time		11/19/2004 13:50			5/2/2005 15:00			5/2/2005 12:55			5/2/2005 14:10		
Depth_upper (ft bgs)					12.8			14.3			12.1		
Depth_lower (ft bgs)													
Analyte	DL												
Aluminum	20	ND			100000			360000			10000		
Antimony	0.15	130			ND		R	ND		R	ND	R	R
Arsenic	0.12	43			28		J	60		J	4.3	J	J
Barium	0.37	640			1400			3200			210		
Beryllium	0.061	22		J	4.4		J	29		J	1.2	J	J
Cadmium	0.051	25			1.6			5			ND		
Calcium	76	ND			100000			340000			200000		
Chromium	2.1	ND			160			930			15		
Cobalt	0.67	170			50			180			ND		
Copper	0.97	ND			98			710			12		
Iron	19	360			170000			810000			17000		
Lead	2.1	18			110			630			10		
Magnesium	27	14000			33000			120000			39000		
Manganese	0.54	85			5800			12000			290		
Mercury	0.025	ND			ND			1.3			ND		
Nickel	4.2	ND			70			330			ND		
Potassium	460	19000			19000			63000			11000		
Selenium	4.6	77			ND			21			ND		
Silver	0.7	33			ND			ND			ND		
Sodium	1100	ND			300000			270000			250000		
Thallium	0.047	32			1.2			3.5			ND		
Vanadium	2.6	ND			220			1000			50		
Zinc	7.1	120		J	420			1600			41		
pH													
Hardness (mg/L)													
Specific Conductance (umhos/cm)													
Conductivity (uS/cm)													
Total Dissolved Solids (mg/L)													
Temperature													

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation
ND = Non-detect

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit
R = Rejected.

Table C-2a.
Groundwater Sampling Results
Total Metals (ug/L)

Station		PS-5			PS-6			PS-7			PS-11		
Sample Type		Field			Field			Field			Field		
Sample ID		PS-5-050205			PS-6-050205			PS-7-050205			KP-PS-11-092005		
Parent Sample ID													
Sample Date/Time		5/2/2005 11:00			5/2/2005 10:20			5/2/2005 9:20			9/20/2005 12:30		
Depth_upper (ft bgs)		11.25			11.8			12.7			9.62		
Depth_lower (ft bgs)													
Analyte	DL							Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	20	44000			7700			110000			8200		
Antimony	0.15	ND	R	R	ND		R	ND		R	ND		UJ
Arsenic	0.12	15	J	J	2.8		J	47		J	2.8		
Barium	0.37	670			180			1400			230		
Beryllium	0.061	4.4	J	J	ND		UJ	7.8		J	ND		
Cadmium	0.051	35			68			150			ND		
Calcium	76	240000			250000			630000			160000		
Chromium	2.1	160			12			100			12		
Cobalt	0.67	43			ND			67			13		
Copper	0.97	70			ND			240			16		
Iron	19	94000			10000			130000			12000		
Lead	2.1	64			7.2			120			19		
Magnesium	27	48000			41000			90000			35000		
Manganese	0.54	1100			510			2000			440		
Mercury	0.025	ND			ND			ND			ND		R
Nickel	4.2	56			ND			69			ND		
Potassium	460	18000			10000			25000			22000		
Selenium	4.6	ND			ND			43			ND		
Silver	0.7	ND			ND			ND			ND		
Sodium	1100	330000			390000			610000			240000		
Thallium	0.047	ND			ND			1.6			ND		
Vanadium	2.6	140			15			230			16		
Zinc	7.1	2100			330			4800			90		
pH													
Hardness (mg/L)													
Specific Conductance (umhos/cm)													
Conductivity (uS/cm)													
Total Dissolved Solids (mg/L)													
Temperature													

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation
ND = Non-detect

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit
R = Rejected.

Table C-2a.
Groundwater Sampling Results
Total Metals (ug/L)

Station		PS-12			PS-13			PS-14			PS-15		
Sample Type		Field			Field			Field			Field		
Sample ID		KP-PS-12-092005			KP-PS-13-092005			KP-PS-14-092005			KP-PS-15-091905		
Parent Sample ID													
Sample Date/Time		9/20/2005 11:25			9/20/2005 10:05			9/20/2005 9:00			9/19/2005 14.45		
Depth_upper (ft bgs)		10.23			8.86			8.66			11.2		
Depth_lower (ft bgs)													
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	20	17000			12000			7700			87000		
Antimony	0.15	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	0.12	3.9			6.2			2.2			15		
Barium	0.37	310			220			170			1100		
Beryllium	0.061	1.1			ND			ND			5.7		
Cadmium	0.051	1.2			1.4			9.3			25		
Calcium	76	130000			120000			150000			160000		
Chromium	2.1	22			16			ND			220		
Cobalt	0.67	ND			25			ND			40		
Copper	0.97	28			21			14			170		
Iron	19	19000			15000			8100			120000		
Lead	2.1	25			21			12			130		
Magnesium	27	32000			27000			32000			46000		
Manganese	0.54	360			680			1500			4900		
Mercury	0.025	ND		R	ND		R	ND		R	ND		
Nickel	4.2	ND			ND			ND			84		
Potassium	460	27000			30000			21000			37000		
Selenium	4.6	ND			ND			ND			ND		
Silver	0.7	ND			ND			ND			ND		
Sodium	1100	190000			160000			210000			220000		
Thallium	0.047	ND			ND			ND			1.2		
Vanadium	2.6	34			28			18			170		
Zinc	7.1	130			130			60			940		
pH													
Hardness (mg/L)													
Specific Conductance (umhos/cm)													
Conductivity (uS/cm)													
Total Dissolved Solids (mg/L)													
Temperature													

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation
ND = Non-detect

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit
R = Rejected.

Table C-2a
Groundwater Sampling Results
Total Metals (ug/L)

Station		PS-16			PS-17			PS-18			PS-19		
Sample Type		Field			Field			Field			Field		
Sample ID		KP-PS-16-091905			KP-PS-17-091905			KP-PS-18-091905			KP-PS-19-091905		
Parent Sample ID													
Sample Date/Time		9/19/2005 13:30			9/19/2005 12:20			9/19/2005 11:15			9/19/2005 9:45		
Depth_upper (ft bgs)		9.8			9.6			12.2			11.6		
Depth_lower (ft bgs)													
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	20	4600			26000			32000			140000		
Antimony	0.15	ND		UJ	ND		UJ	ND		UJ	ND		UJ
Arsenic	0.12	ND			10			11			22		
Barium	0.37	160			590			670			1400		
Beryllium	0.061	ND			2			2.4			10		
Cadmium	0.051	5.6			8.4			14			2.8		
Calcium	76	110000			110000			110000			130000		
Chromium	2.1	ND			43			60			150		
Cobalt	0.67	ND			15			27			50		
Copper	0.97	ND			75			69			220		
Iron	19	4300			35000			49000			180000		
Lead	2.1	3.4			81			54			160		
Magnesium	27	26000			30000			29000			50000		
Manganese	0.54	260			780			6800			5200		
Mercury	0.025	ND			ND			ND			0.25		
Nickel	4.2	ND			ND			47			99		
Potassium	460	31000			36000			34000			47000		
Selenium	4.6	ND			ND			ND			ND		
Silver	0.7	ND			ND			ND			ND		
Sodium	1100	180000			170000			170000			160000		
Thallium	0.047	ND			ND			ND			1.5		
Vanadium	2.6	10			57			79			280		
Zinc	7.1	37			390			470			720		
pH													
Hardness (mg/L)													
Specific Conductance (umhos/cm)													
Conductivity (uS/cm)													
Total Dissolved Solids (mg/L)													
Temperature													

DL = Detection Limit (note DL is the reporting limit)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation
ND = Non-detect

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit
R = Rejected.

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Table C-2b.
Groundwater Sampling Results
Dissolved Metals (ug/L)

Station		04			07		
Sample Type		Field			Field		
Sample ID		01-VBOU3-GW-0004			01-VBOU3-GW-0001		
Parent Sample ID							
Sample Date/Time		12-18-2003			12-12-2003		
Depth_upper (ft bgs)		11.0			12.2		
Depth_lower (ft bgs)							
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	20	ND	U		2.46	B	
Antimony	2	3.25	B		32.8		
Arsenic	2	36.4			25		
Barium	4	ND	U		ND	U	
Beryllium	1	1770			8.73		
Cadmium	0.6	375600			382000		
Calcium	100	ND	U		ND	U	
Chromium	2	35.8			13.6		
Cobalt	2	30.6	B		ND	U	
Copper	8	261	B		25800		
Iron	100	1.35	B		2.3	B	
Lead	0.6	48300			60900		
Magnesium	300	5420			8190		
Manganese	10	ND	U		ND	U	
Mercury	0.06	30.3			36.6		
Nickel	4	9910			14400		
Potassium	400	7.06	B		10.6		
Selenium	2	ND	U		ND	U	
Silver	0.4	877000			764000		
Sodium	200	2.03			0.62	B	
Thallium	0.2	12.1	B		12.5	B	
Vanadium	6	10300			1240		
Zinc	4				63.2	B	
pH		4.6			5.1		
Hardness (mg/L)		1136.8			1204.6		
Specific Conductance (umhos/cm)							
Conductivity (uS/cm)		2.17			1.52		
Total Dissolved Solids (mg/L)							
Temperature		41			58.9		

DL = Detection Limit
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation
ND = Non-detect

Qualifiers:
B = Concentration qualifier, above reporting lmit, less than PQL
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit

Table C-2b.
Groundwater Sampling Results
Dissolved Metals (ug/L)

Station		32			32			33			33		
Sample Type		Field			Field			Field			Field		
Sample ID		MW-32-070104			MW-32-072804			MW-33-050304			MW-33-052104		
Parent Sample ID													
Sample Date/Time		7/1/2004 10:40:00 AM			7/28/2004 10:00:00 AM			5/3/2004 3:20:00 PM			5/21/2004 9:30:00 AM		
Depth_upper (ft bgs)		6.1			3.9			16.1			15.6		
Depth_lower (ft bgs)													
Analyte	**DL**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**
Aluminum	100	ND			ND			ND			ND		
Antimony	2	1.7			2.9			2			2		
Arsenic	1	55			46			24			23		
Barium	10	ND			ND			ND			ND		
Beryllium	1	ND			ND			69			40		
Cadmium	1	190000			140000			74000			66000		
Calcium	200	ND			ND			ND			ND		
Chromium	10	11			20			18			ND		
Cobalt	10	16			ND			ND			ND		
Copper	10	ND			3000			ND			ND		
Iron	100	ND			ND			ND			ND		
Lead	3	24000			18000			7400			6600		
Magnesium	200	71			610			1200			450		
Manganese	10	ND			ND			ND			ND		
Mercury	0.2	ND			ND			ND			ND		
Nickel	40	ND			ND			ND			ND		
Potassium	3000	ND			ND			ND			ND		
Selenium	15	ND			ND			ND			ND		
Silver	10	590000			440000			120000			88000		
Sodium	5000	ND			ND			ND			ND		
Thallium	1	ND			ND			ND			ND		
Vanadium	10	ND			ND			190			180		
Zinc	20	108			ND			ND			ND		
pH								6.5			6.5		
Hardness (mg/L)													
Specific Conductance (umhos/cm)								780			800		
Conductivity (uS/cm)													
Total Dissolved Solids (mg/L)											160		
Temperature													

DL = Detection Limit (note DL is the reporting limit for Round 2 and Round 3 samples)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit

Table C-2b.
Groundwater Sampling Results
Dissolved Metals (ug/L)

Station		33			33			34			34		
Sample Type		Field			Field			Field			Field		
Sample ID		MW-33-070104			MW-33-072804			MW-34-052104			MW-34-070104		
Parent Sample ID													
Sample Date/Time		7/1/2004 8:50:00 AM			7/28/2004 8:50:00 AM			5/21/2004 10:25:00 AM			7/1/2004 9:55:00 AM		
Depth_upper (ft bgs)		15.6			15.7			21.1			20		
Depth_lower (ft bgs)													
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	100	ND			ND			ND			ND		
Antimony	2	2.8			2.2			1			1.3		
Arsenic	1	26			35			62			48		
Barium	10	ND			ND			ND			ND		
Beryllium	1	26			34			5.9		J	2.1		
Cadmium	1	73000			100000			630000			540000		
Calcium	200	ND			ND			ND			ND		
Chromium	10	ND			ND			ND			ND		
Cobalt	10	ND			ND			11			ND		
Copper	10	ND			ND			180			ND		
Iron	100	ND			ND			ND			ND		
Lead	3	7000			10000			57000			61000		
Magnesium	200	15			ND			640			98		
Manganese	10	ND			ND			ND			ND		
Mercury	0.2	ND			ND			ND			ND		
Nickel	40	ND			ND			12000			9400		
Potassium	3000	ND			ND			ND			ND		
Selenium	15	ND			ND			ND		UJ	ND		
Silver	10	92000			120000			680000			630000		
Sodium	5000	ND			ND			ND			ND		
Thallium	1	ND			ND			ND		UJ	ND		
Vanadium	10	200			260			45			ND		
Zinc	20	ND			ND			ND			ND		
pH		6.6			6.6								
Hardness (mg/L)													
Specific Conductance (umhos/cm)		840			1000								
Conductivity (uS/cm)													
Total Dissolved Solids (mg/L)		500			630								
Temperature													

DL = Detection Limit (note DL is the reporting limit for Round 2 and Round 3 samples)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit

Table C-2b.
Groundwater Sampling Results
Dissolved Metals (ug/L)

Station		34			35			35			36		
Sample Type		Field			Field			Field			Field		
Sample ID		*MW-34-072804*			*MW-35-052404*			*MW-35-072804*			*MW-36-052404*		
Parent Sample ID													
Sample Date/Time		7/28/2004 9:15:00 AM			5/24/2004 1:35:00 PM			7/28/2004 10:55:00 AM			5/24/2004 1:35:00 PM		
Depth_upper (ft bgs)		19.8			11.2			11.2			8.9		
Depth_lower (ft bgs)													
Analyte	**DL**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**
Aluminum	100	ND			ND			ND			ND		
Antimony	2	ND			1			ND			ND		
Arsenic	1	36			76			1			6		
Barium	10	ND			ND			110			110		
Beryllium	1	1.8			3			ND			ND		
Cadmium	1	380000			120000			3.6			47		
Calcium	200	ND			ND			120000			430000		
Chromium	10	ND			ND			ND			ND		
Cobalt	10	ND			ND			ND			11		
Copper	10	ND			ND			ND			27		
Iron	100	ND			ND			ND			150		
Lead	3	42000			14000			ND			ND		
Magnesium	200	23			11			14000			50000		
Manganese	10	ND			ND			ND			3800		
Mercury	0.2	ND			ND			ND			ND		
Nickel	40	7300			4100			4200			ND		
Potassium	3000	ND			ND			ND			8700		
Selenium	15	ND			ND			ND			ND		
Silver	10	540000			140000			140000			ND		
Sodium	5000	ND			ND			ND			380000		
Thallium	1	ND			ND			ND			ND		
Vanadium	10	ND			ND			23			ND		
Zinc	20	ND			ND			ND			98		
pH													
Hardness (mg/L)													
Specific Conductance (umhos/cm)													
Conductivity (uS/cm)													
Total Dissolved Solids (mg/L)													
Temperature													

DL = Detection Limit (note DL is the reporting limit for Round 2 and Round 3 samples)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit

Table C-2b.
Groundwater Sampling Results
Dissolved Metals (ug/L)

Station		36						GW-15			GW-16		
Sample Type		Field			Field			FIELD			FIELD		
Sample ID		MW-36-070104			MW-36-072804			KP-GW-15-111904			KP-GW-16-111904		
Parent Sample ID													
Sample Date/Time		7/1/2004 12:15:00 PM			7/28/2004 10:30:00 AM			11/19/2004 11:35			11/19/2004 10:15		
Depth_upper (ft bgs)		8.4			8.5			15.45			9.02		
Depth_lower (ft bgs)													
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	100	ND			ND			ND			ND		
Antimony	2	ND			ND			ND			ND		
Arsenic	1	9.2			6.1			ND			ND		
Barium	10	100			86			120			71		
Beryllium	1	ND			ND			ND			ND		
Cadmium	1	26			53			110			50		
Calcium	200	410000			450000			200000			230000		
Chromium	10	ND			ND			ND			ND		
Cobalt	10	ND			ND			ND			ND		
Copper	10	22			22			ND			ND		
Iron	100	ND			ND			ND			120		
Lead	3	ND			ND			ND			ND		
Magnesium	200	46000			51000			34000			37000		
Manganese	10	1900			540			34			330		
Mercury	0.2	ND			ND			ND			ND		
Nickel	40	ND			ND			ND			ND		
Potassium	3000	8000			8200			9200			8200		
Selenium	15	ND			ND			ND			ND		
Silver	10	ND			ND			ND			ND		
Sodium	5000	380000			420000			250000			260000		
Thallium	1	ND			ND			ND			ND		
Vanadium	10	ND			ND			ND			ND		
Zinc	20	140			110			130			150		
pH													
Hardness (mg/L)													
Specific Conductance (umhos/cm)													
Conductivity (uS/cm)													
Total Dissolved Solids (mg/L)													
Temperature													

DL = Detection Limit (note DL is the reporting limit for Round 2 and Round 3 samples)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit

Table C-2b.
Groundwater Sampling Results
Dissolved Metals (ug/L)

Station		GW-17			GW-46			PS-1			PS-3		
Sample Type		FIELD			FIELD			FIELD			FIELD		
Sample ID		KP-GW-17-111904			KP-GW-46-111904			PS-1-050205			PS-3-050205		
Parent Sample ID													
Sample Date/Time		11/19/2004 12:45			11/19/2004 14:00			5/2/2005 15:00			5/2/2005 12:55		
Depth_upper (ft bgs)		15.57			9.7			12.8			14.3		
Depth_lower (ft bgs)													
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	100	ND			ND			190			ND		
Antimony	2	ND			ND			ND			ND		
Arsenic	1	ND			ND			ND			1.3		
Barium	10	16			77			65			210		
Beryllium	1	ND			ND			ND			ND		
Cadmium	1	ND			24			ND			ND		
Calcium	200	110000			190000			65000			290000		
Chromium	10	ND			ND			ND			ND		
Cobalt	10	ND			ND			ND			ND		
Copper	*10*	*ND*			*ND*			*ND*			*ND*		
Iron	100	ND			ND			150			180		
Lead	3	ND			ND			ND			ND		
Magnesium	200	12000			29000			12000			51000		
Manganese	10	11			ND			360			330		
Mercury	0.2	ND			ND			ND			ND		
Nickel	40	ND			ND			ND			ND		
Potassium	3000	ND			6400			8600			11000		
Selenium	15	ND			ND			ND			ND		
Silver	10	ND			ND			ND			ND		
Sodium	5000	150000			240000			330000			390000		
Thallium	1	ND			ND			ND			ND		
Vanadium	10	ND			ND			ND			ND		
Zinc	20	ND			180			ND			ND		
pH													
Hardness (mg/L)													
Specific Conductance (umhos/cm)													
Conductivity (uS/cm)													
Total Dissolved Solids (mg/L)													
Temperature													

DL = Detection Limit (note DL is the reporting limit for Round 2 and Round 3 samples)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit

Table C-2b.
Groundwater Sampling Results
Dissolved Metals (ug/L)

Station		PS-4			PS-5			PS-6			PS-7		
Sample Type		FIELD			FIELD			FIELD			FIELD		
Sample ID		PS-4-050205			PS-5-050205			PS-6-050205			PS-7-050205		
Parent Sample ID													
Sample Date/Time		5/2/2005 14:10			5/2/2005 11:00			5/2/2005 10:20			5/2/2005 9:20		
Depth_upper (ft bgs)		12.1			11.25			11.8			12.7		
Depth_lower (ft bgs)													
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	100	ND			ND			ND			ND		
Antimony	2	ND			ND			ND			ND		
Arsenic	1	1.1			ND			ND			2.8		
Barium	10	150			130			76			64		
Beryllium	1	ND			ND			ND			ND		
Cadmium	1	ND			22			62			83		
Calcium	200	200000			220000			250000			640000		
Chromium	10	ND			ND			ND			ND		
Cobalt	10	ND			20			ND			ND		
Copper	10	ND			ND			ND			ND		
Iron	100	300			1000			ND			ND		
Lead	3	ND			7			ND			ND		
Magnesium	200	36000			39000			40000			83000		
Manganese	10	140			470			190			100		
Mercury	0.2	ND			ND			ND			ND		
Nickel	40	ND			ND			ND			ND		
Potassium	3000	8000			9000			9100			8500		
Selenium	15	ND			ND			ND			ND		
Silver	10	ND			ND			ND			ND		
Sodium	5000	240000			330000			400000			660000		
Thallium	1	ND			ND			ND			ND		
Vanadium	10	ND			ND			ND			ND		
Zinc	20	ND			180			250			360		
pH													
Hardness (mg/L)													
Specific Conductance (umhos/cm)													
Conductivity (uS/cm)													
Total Dissolved Solids (mg/L)													
Temperature													

DL = Detection Limit (note DL is the reporting limit for Round 2 and Round 3 samples)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit

Table C-2b.
Groundwater Sampling Results
Dissolved Metals (ug/L)

Station		PS-11			PS-12			PS-13			PS-14		
Sample Type		Field			Field			Field			Field		
Sample ID		KP-PS-11-092005			KP-PS-12-092005			KP-PS-13-092005			KP-PS-14-092005		
Parent Sample ID													
Sample Date/Time		9/20/2005 12:30			9/20/2005 11:25			9/20/2005 10:05			9/20/2005 9:00		
Depth_upper (ft bgs)		9.62			10.23			8.86			8.66		
Depth_lower (ft bgs)													
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	100	500			ND			ND			ND		
Antimony	2	ND			ND			ND			ND		
Arsenic	1	ND			ND			ND			1		
Barium	10	130			120			120			99		
Beryllium	1	ND			ND			ND			ND		
Cadmium	1	ND			ND			ND			7.7		
Calcium	200	170000			150000			120000			160000		
Chromium	10	ND			ND			ND			ND		
Cobalt	10	12			ND			23			ND		
Copper	10	ND			ND			ND			ND		
Iron	100	850			200			690			100		
Lead	3	ND			ND			ND			ND		
Magnesium	200	34000			31000			25000			33000		
Manganese	10	360			230			780			1500		
Mercury	0.2	ND			ND			ND			ND		
Nickel	40	ND			ND			ND			ND		
Potassium	3000	21000			25000			28000			20000		
Selenium	15	ND			ND			ND			ND		
Silver	10	ND			ND			ND			ND		
Sodium	5000	250000			210000			170000			230000		
Thallium	1	ND			ND			ND			ND		
Vanadium	10	ND			ND			ND			ND		
Zinc	20	27			21			50			22		
pH													
Hardness (mg/L)													
Specific Conductance (umhos/cm)													
Conductivity (uS/cm)													
Total Dissolved Solids (mg/L)													
Temperature													

DL = Detection Limit (note DL is the reporting limit for Round 2 and Round 3 samples)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit

Table C-2b.
Groundwater Sampling Results
Dissolved Metals (ug/L)

Station		PS-15			PS-16			PS-17			PS-18		
Sample Type		Field			Field			Field			Field		
Sample ID		KP-PS-15-091905			KP-PS-16-091905			KP-PS-17-091905			KP-PS-18-091905		
Parent Sample ID													
Sample Date/Time		9/19/2005 14:45			9/19/2005 13:30			9/19/2005 12:20			9/19/2005 11:15		
Depth_upper (ft bgs)		11.2			9.8			9.6			12.2		
Depth_lower (ft bgs)													
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	*100*	*190*			*280*			*ND*			*160*		
Antimony	2	ND			ND			ND			ND		
Arsenic	1	ND			ND			ND			ND		
Barium	10	87			140			130			170		
Beryllium	1	ND			ND			ND			ND		
Cadmium	1	8.3			4.8			3.3			2.3		
Calcium	200	160000			120000			120000			110000		
Chromium	10	ND			ND			ND			ND		
Cobalt	10	ND			ND			ND			ND		
Copper	10	ND			ND			ND			ND		
Iron	100	850			230			190			240		
Lead	3	ND			ND			ND			ND		
Magnesium	200	32000			26000			26000			25000		
Manganese	10	3700			210			420			2900		
Mercury	0.2	ND			ND			ND			ND		
Nickel	40	ND			ND			ND			ND		
Potassium	3000	20000			30000			32000			29000		
Selenium	15	ND			ND			ND			ND		
Silver	10	ND			ND			ND			ND		
Sodium	5000	230000			190000			190000			180000		
Thallium	1	ND			ND			ND			ND		
Vanadium	10	ND			ND			ND			ND		
Zinc	20	54			21			62			36		
pH													
Hardness (mg/L)													
Specific Conductance (umhos/cm)													
Conductivity (uS/cm)													
Total Dissolved Solids (mg/L)													
Temperature													

DL = Detection Limit (note DL is the reporting limit for Round 2 and Round 3 samples)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit

Table C-2b.
Groundwater Sampling Results
Dissolved Metals (ug/L)

Station		PS-19		
Sample Type		Field		
Sample ID		KP-PS-19-091905		
Parent Sample ID				
Sample Date/Time		9/19/2005 9:45		
Depth_upper (ft bgs)		11.6		
Depth_lower (ft bgs)				
Analyte	DL	Result	Qual_L	Qual_V
Aluminum	100	ND		
Antimony	2	ND		
Arsenic	1	1.1		
Barium	10	150		
Beryllium	1	ND		
Cadmium	1	ND		
Calcium	200	200000		
Chromium	10	ND		
Cobalt	10	ND		
Copper	10	ND		
Iron	100	300		
Lead	3	ND		
Magnesium	200	36000		
Manganese	10	140		
Mercury	0.2	ND		
Nickel	40	ND		
Potassium	3000	8000		
Selenium	15	ND		
Silver	10	ND		
Sodium	5000	240000		
Thallium	1	ND		
Vanadium	10	ND		
Zinc	20	ND		
pH				
Hardness (mg/L)				
Specific Conductance (umhos/cm)				
Conductivity (uS/cm)				
Total Dissolved Solids (mg/L)				
Temperature				

DL = Detection Limit (note DL is the reporting limit for Round 2 and Round 3 samples)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit

ANALYTICAL RESULTS FOR SURFACE WATER

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Tab[illegible]3.
Surface Water Sampling Results
Total Metals (ug/L)

Station		**SW-1**			**SW-2**		
Sample Type		FIELD			FIELD		
Sample ID		**KP-SW-1-032805**			**KP-SW-2-032805**		
Parent Sample ID							
Sample Date/Time		3/28/2005 13:45			3/28/2005 14:25		
Depth_upper (ft bgs)							
Depth_lower (ft bgs)							
Analyte	**DL**	**Result**	**Qual_L**	**Qual_V**	**Result**	**Qual_L**	**Qual_V**
Aluminum	100	ND			230		
Antimony	2	ND			ND		
Arsenic	1	ND			1		
Barium	10	34			33		
Beryllium	1	ND			ND		
Cadmium	1	5.3			4.6		
Calcium	200	70000			66000		
Chromium	10	ND			ND		
Cobalt	10	ND			ND		
Copper	10	ND			ND		
Iron	100	150			240		
Lead	3	ND			ND		
Magnesium	200	12000			12000		
Manganese	10	ND			ND		
Mercury	0.2	ND			ND		
Nickel	40	ND			ND		
Potassium	3000	ND			ND		
Selenium	15	ND			ND		
Silver	10	ND			ND		
Sodium	5000	170000			150000		
Thallium	1	ND			ND		
Vanadium	10	ND			ND		
Zinc	20	22			25		
pH		8.2			8.2		
Hardness (mg/L)							
Specific Conductance (umhos/cm)		1200			1100		
Conductivity (uS/cm)							
Total Dissolved Solids (mg/L)							
Temperature							

DL = Detection Limit (note DL is the reporting limit for Round 2 samples)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation
ND = Non-detect

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Analytical Results for Equipment Decontamination Rinsate

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Table C-4.
Total Metals in Equipment Decontamination Rinsate (ug/L)

Station		16			31			22			33		
Sample Type		Field QC - Rinsate			Field QC - Rinsate			Field QC - Rinsate			Field QC - Rinsate		
Sample ID		01-VBOU3-RIN-0001			01-VBOU3-RIN-0002			01-VBOU3-RIN-0003			01-VBOU3-RIN-0004		
Parent Sample ID													
Sample Date/Time		12/10/2003 13:05			12/11/2003 10:00			12/12/2003 9:40			12/18/2003 14:45		
Depth_upper (ft bgs)													
Depth_lower (ft bgs)													
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	100	ND			210			ND			120		
Antimony	2	ND		R	ND			ND			ND		
Arsenic	1	ND			ND			ND			ND		
Barium	10	ND			ND			ND			ND		
Beryllium	1	ND			ND			ND			ND		
Cadmium	1	ND			ND			ND			ND		
Calcium	200	ND			240			520			270		
Chromium	10	ND			ND			ND			ND		
Cobalt	10	ND			ND			ND			ND		
Copper	10	ND			ND			ND			ND		
Iron	100	220		J	420			170			180		
Lead	3	ND			ND			ND			3		
Magnesium	200	ND			ND			200			ND		
Manganese	10	ND			ND			ND			ND		
Mercury	0.2	ND			ND			ND		R	ND		
Nickel	40	ND			ND			ND			ND		
Potassium	3000	ND			ND			ND			ND		
Selenium	5	ND			ND			ND			ND		
Silver	10	ND			ND			ND			ND		
Sodium	5000	ND			ND			ND			ND		
Thallium	1	ND			ND			ND			ND		
Vanadium	10	ND			ND			ND			ND		
Zinc	20	ND			ND			ND			ND		
pH													
Hardness (mg/L)													
Specific Conductance (umhos/cm)													
Conductivity (uS/cm)													
Total Dissolved Solids (mg/L)													
Temperature													

DL = Detection Limit (note DL is the reporting limit for Round 2 and Round 3 samples)
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation
ND = Non-detect

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit
R = Rejected.

Table C-4.
Total Metals in Equipment Decontamination Rinsate (ug/L)

Station		01			31			31			31			31		
Sample Type		Field QC - Rinsate			Field QC - Rinsate			Field QC - Rinsate			Field QC - Rinsate			Field QC - Rinsate		
Sample ID		01-VBOU3-RIN-0005			MW-31-070104			MW-31-072804			MW-31-111904			MW-31-050205		
Parent Sample ID																
Sample Date/Time		12/19/2003 11:25			7/1/2004 10:05:00 AM			7/28/2004 9:35:00 AM			11/19/2004 12:55			5/2/2005 10:30		
Depth_upper (ft bgs)																
Depth_lower (ft bgs)																
Analyte	DL	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V	Result	Qual_L	Qual_V
Aluminum	100	110			ND			ND			ND			ND		
Antimony	2	ND			ND			ND			ND			ND	R	R
Arsenic	1	ND			ND			ND			ND			ND	J	J
Barium	10	ND			ND			ND			ND			ND		
Beryllium	1	ND			ND			ND			ND			ND	UJ	UJ
Cadmium	1	ND			ND			ND			ND			ND		
Calcium	200	280			290			ND			ND			ND		
Chromium	10	ND			ND			ND			ND			ND		
Cobalt	10	ND			ND			ND			ND			ND		
Copper	10	ND			ND			ND			ND			ND		
Iron	100	220			ND			ND			ND			ND		
Lead	3	ND			ND			ND			ND			ND		
Magnesium	200	ND			ND			ND			ND			ND		
Manganese	10	12			ND			ND			ND			ND		
Mercury	0.2	ND			ND			ND			ND			ND		
Nickel	40	ND			ND			ND			ND			ND		
Potassium	3000	ND			ND			ND			ND			ND		
Selenium	5	ND			ND			ND			ND			ND		
Silver	10	ND			ND			ND			ND			ND		
Sodium	5000	ND			ND			ND			ND			ND		
Thallium	1	ND			ND			ND			ND			ND		
Vanadium	10	ND			ND			ND			ND			ND		
Zinc	20	ND			ND			ND			ND		UJ	ND		
pH																
Hardness (mg/L)																
Specific Conductance (umhos/cm)																
Conductivity (uS/cm)																
Total Dissolved Solids (mg/L)																
Temperature																

DL = Detection Limit (note DL is the reporting limit for Round
Qual_L = Qualifier assigned by laboratory
Qual_V = Qualifier assigned during data validation
ND = Non-detect

Qualifiers:
J = Result is an estimated quantity
U = Undetected, result is less than the detection limit
R = Rejected,

ASARCO GLOBE PLANT GROUNDWATER DATA

Table C-5. Groundwater Data from the Remedial Investigation of the Globe Plant

Sample Location	Date	Lab	Depth ft bgs	Groundwater Concentration (ug/L) Arsenic Total	Arsenic Dissolved	Cadmium Total	Cadmium Dissolved	Lead Total	Lead Dissolved	Zinc Total	Zinc Dissolved
BH-12	9/17/1985	C	9.26	--	0.01	--	<0.001	--	0.01	--	<0.01
BH-12	8/22/1986	D		--	<0.004	--	<0.001	--	<0.005	--	<0.008
BH-12	6/29/1987	D		0.009	<0.006	0.004	0.004	0.061	<0.005	0.164	0.014
BH-12	9/1/1987	D	8.89	--	<0.006	--	0.003	--	<0.005	--	0.028
BH-12	11/18/1987	R	9.32	--	<0.003	--	0.0034	--	<0.004	--	<0.01
BH-12	11/18/1987	D	9.32	--	<0.006	--	<0.001	--	<0.005	--	0.012
BH-12	11/18/1987	C	9.32	--	<0.01	--	0.011	--	<0.01	--	0.01
GW-15	11/13/1985	D	14.21	--	<.050	0.068	0.068		0.033	--	0.1
GW-15	11/13/1985	R	14.21	0.05	<.05	0.061	0.06	<0.025	<0.025	0.099	0.093
GW-15	11/13/1985	C	14.21	--	--	--	0.07	--	--	--	--
GW-15	3/19/1986	C		--	--	0.077	--	--	--	0.17	--
GW-15	5/6/1986	C		--	--	0.061	--	--	--	0.07	--
GW-15	7/2/1986	D	13.73	--	--	0.114	--	--	--	0.263	--
GW-15	7/2/1986	C	13.73	<0.01	--	0.12	--	0.01	--	0.23	--
GW-15	7/2/1986	R	13.73	<0.05	--	0.11	--	0.03	--	0.3	--
GW-15	8/25/1986	D			<0.004		0.06	--	<0.005	--	0.069
GW-15	9/2/1986	D		0.025	--	0.141	--	0.025	--	0.375	--
GW-15	11/6/1986	D		0.052	--	0.146	--	0.041	--	0.363	--
GW-15	11/6/1986	C		<0.01	--	0.175	--	0.04	--	0.39	--
GW-15	1/13/1987	D		0.021	--	0.087	--	0.013	--	0.15	--
GW-15	3/17/1987	D		0.09	0.008	0.32	0.054	0.19	<0.005	1.5	0.13
GW-15	6/27/1987	R	13.65	0.011	<0.003	0.1	0.061	0.026	<0.004	0.34	0.06
GW-15	6/27/1987	C	13.65	<0.01	<0.01	0.095	0.062	0.02	<0.01	0.26	0.05
GW-15	6/27/1987	D	13.65	0.031	<0.006	0.108	0.07	0.035	<0.005	0.35	0.05
GW-15	9/2/1987	D		<0.006	<0.006	0.079	0.073	0.017	<0.005	0.184	0.072
GW-15	11/20/1987	D			<0.006		0.059	--	<0.005	--	0.06
GW-16	6/5/1986	C		--	<0.01	--	0.039	--	<0.01	--	0.12
GW-16	6/5/1986	D		--	<0.004	--	0.04	--	<0.005	--	0.22
GW-16	8/14/1986	D		--	<0.004	--	0.03	--	0.027	--	0.121
GW-16	6/27/1987	D	8.55	<0.006	<0.006	0.031	0.031	<0.005	<0.005	0.132	0.125
GW-16	9/2/1987	D	9	--	<0.006	--	0.044	--	<0.005	--	0.213
GW-16	11/20/1987	D		--	<0.006	--	0.032	--	<0.005	--	0.111
GW-17	7/11/1986	D	12.97	--	0.011	--	<0.001	--	<0.005	--	0.008
GW-17	8/21/1986	D		--	0.005	--	<0.001	--	<0.005	--	<0.008
GW-17	8/30/1987	D		--	<0.006	--	0.006	--	<0.005	--	0.02
GW-46	6/17/1987	R	9.48	--	0.02	--	0.023	--	<0.004	--	0.11
GW-46	6/17/1987	D	9.48	--	<0.006	--	0.02	--	<0.005	--	0.101
GW-46	6/17/1987	C	9.48	--	<0.01	--	0.023	--	<0.01	--	0.11
GW-46	9/1/1987	C	9.83	--	<0.01	--	0.023	--	<0.01	--	0.15
GW-46	9/1/1987	R	9.83	--	<0.006	--	0.025	--	<0.008	--	0.16
GW-46	9/1/1987	D	9.83	--	0.009	--	0.031	--	<0.005	--	0.183
GW-46	9/30/1987	D		--	<0.006	--	0.022	--	0.016	--	0.185
GW-46	10/22/1987	D		--	<0.006	--	0.022	--	<0.005	--	0.216
GW-46	11/23/1987	D		--	<0.006	--	0.015	--	<0.005	--	0.156
GW-46	12/30/1987	D	11.42	--	<0.006	--	0.016	--	<0.005	--	0.17

Source: TRC 1988

Table C-6. Quarterly Groundwater Monitoring Data (1993-2001)
ASARCO Globe Plant Monitoring Wells

Location	date_samp	T/D	Type	Lab Code	Source	Water Level	Field Temp	Cond @ STP	Field pH	As ppb	Cd ppb	Pb ppb	Zn ppb
GW-15	9/17/1993	D	SAMPL	DOES	GW	5131.4	14.2	705	6.5	<5.0	<1.0	<5.0	<8.0
GW-15	11/18/1993	D	DUPE	DOES	GW	5131.27	15.4	680	6.74	<5.	86.	<5.	70.
GW-15	11/18/1993	D	SAMPL	DOES	GW	5131.27	15.6	689	6.77	<5.	74.	<5.	71.
GW-15	2/23/1994	D	SAMPL	DOES	GW	5131	14.2	632	6.81	<5.	61.	<5.	71.
GW-15	5/26/1994	D	SPLIT	CORE	GW	5131.45	14.3	1180	6.75	<5	59	<2	80
GW-15	5/26/1994	D	SAMPL	DOES	GW	5131.45	14.3	1180	6.75	<5.	62.	<5.	96.
GW-15	9/8/1994	D	SAMPL	DOES	GW	5131.39	16.6	1090	6.69	<5.	61.	<5.	70.
GW-15	11/2/1994	D	SAMPL	DOES	GW	5131.17	13.8	881	6.91	<5.	61.	<5.	96.
GW-15	2/22/1995	D	SAMPL	DOES	GW	5130.94	15.9	1250	6.77	<5.	71.	<5.	83.
GW-15	2/22/1995	D	DUPE	DOES	GW	5130.94	15.3	1240	6.75	<5.	70.	<5.	78.
GW-15	5/23/1995	D	SAMPL	DOES	GW	5131.51	12.9	1270	6.58	<5.	9.9	<5.	241.
GW-15	8/9/1995	D	SAMPL	DOES	GW	5132.8	17.1	1290	6.7	<5.	73.	<5.	107.
GW-15	11/9/1995	D	SPLIT	CORE	GW	5131.7	17	1170	6.64	<10.	79.4	<2.	94.
GW-15	11/9/1995	D	SAMPL	DOES	GW	5131.7	17	1170	6.64	<5.	94.	<5.	127.
GW-15	3/7/1996	D	SAMPL	DOES	GW	5131.09	14.1	1170	6.54	<5.	112.	<5.	150.
GW-15	6/24/1996	D	SAMPL	DOES	GW	5131.71	15.1	1090	6.5	<5.	74.	<5.	84.
GW-15	8/28/1996	D	SAMPL	DOES	GW	5131.63	16.8	1210	6.56	<5.	83.	<5.	95.
GW-15	11/26/1996	D	DUPE	DOES	GW	5131.38	12.5	1280	6.39	<5.	41.	<5.	82.
GW-15	11/26/1996	D	SAMPL	DOES	GW	5131.38	12.8	1130	6.39	<5.	44.	<5.	96.
GW-15	3/12/1997	D	SAMPL	DOES	GW	5132.08	15.8	1180	6.55	<5.	47.	<5.	86.
GW-15	6/24/1997	D	SAMPL	DOES	GW	5132.14	15.1	1400	6.34	<5.	119.	<5.	152.
GW-15	9/24/1997	D	SAMPL	DOES	GW	5132.15	15.5	1370	6.48	<5	115	<5	127
GW-15	9/24/1997	D	SPLIT	CORE	GW	5132.15	15.5	1370	6.48	<10	110	<50	130
GW-15	11/19/1997	D	SAMPL	DOES	GW	5131.95	14.1	1060	6.58	<5	96	<5	91
GW-15	3/3/1998	D	SAMPL	DOES	GW	5131.31	13.4	1600	6.78	<5	95	<5	118
GW-15	6/2/1998	D	SAMPL	DOES	GW	5132.71	15.5	1330	6.66	<5	84	<5	93
GW-15	8/26/1998	D	SAMPL	DOES	GW	5132.6	16	1190	6.64	<5	57	<5	84
GW-15	8/26/1998	D	DUPE	DOES	GW	5132.6	15.8	1200	6.67	<5	60	<5	85
GW-15	11/20/1998	D	SAMPL	DOES	GW	5131.89	12.7	997	6.77	<5	65	<5	73
GW-15	2/17/1999	D	SAMPL	DOES	GW	5131.43	12.2	754	6.75	<5	87	N/A	100
GW-15	5/19/1999	D	SAMPL	DOES	GW	5132.68	15	960	6.68	<5	67		70
GW-15	8/20/1999	D	SAMPL	DOES	GW	5133.09	15	1670	6.88	<5	62		74
GW-15	11/11/1999	D	SAMPL	DOES	GW	5132.01	14.6	1660	6.9	<5	66		66
GW-15	11/11/1999	D	SPLIT	STDL	GW	5132.01	14.6	1660	6.9	<10	74	<5	90
GW-15	2/4/2000	D	SAMPL	DOES	GW	5131.5	12.7	1900	6.89	<5	78		89
GW-15	5/9/2000	D	SAMPL	DOES	GW	5131.70	14.3	1822	6.75	<5	87		107
GW-15	8/7/2000	D	SAMPL	DOES	GW	5132.29	14.3	1843	6.73	<5	87		101
GW-15	11/8/2000	D	SAMPL	DOES	GW	5131.90	14.2	1770	6.82	<5	82		<10
GW-15	2/12/2001	D	SAMPL	DOES	GW	5131.36	12.0	1956	6.77	<5	94		98
GW-15	5/23/2001	D	SPLIT	STDL	GW	5132.20	14.1	1440	6.62	<10	100		120
GW-15	5/23/2001	D	SAMPL	DOES	GW	5132.20	14.1	1440	6.62	<5	98		105

Table C-6. Quarterly Groundwater Monitoring Data (1993-2001)
ASARCO Globe Plant Monitoring Wells

Location	date_samp	T/D	Type	Lab Code	Source	Water Level	Field Temp	Cond @ STP	Field pH	As ppb	Cd ppb	Pb ppb	Zn ppb
GW-46	9/17/1993	D	SAMPL	DOES	GW	5133.7	17.1	799	6.35	<5.0	16.	<5.0	180.
GW-46	9/17/1993	D	SPLIT	CORE	GW	5133.7	17.1	799	6.35	<5	14	<2	200
GW-46	11/18/1993	D	SAMPL	DOES	GW	5133.56	15.9	673	6.38	<5.	23.	<5.	150.
GW-46	2/24/1994	D	SAMPL	DOES	GW	5133.26	13	417	6.74	<5.	14.	<5.	181.
GW-46	2/24/1994	D	DUPE	DOES	GW	5133.26	13.2	414	6.78	<5.	14.	<5.	184.
GW-46	5/26/1994	D	SAMPL	DOES	GW	5133.72	14.3	1200	6.63	<5.	19.	<5.	183.
GW-46	9/8/1994	D	SAMPL	DOES	GW	5133.81	17.9	1230	6.79	<5.	23.	<5.	180.
GW-46	11/2/1994	D	SPLIT	CORE	GW	5133.45	15.2	1020	6.67	<5.	17.	<5.	191.
GW-46	11/2/1994	D	SAMPL	DOES	GW	5133.45	15.2	1020	6.67	<5.	18.	<5.	170.
GW-46	2/22/1995	D	SPLIT	CORE	GW	5133.16	15.5	1520	6.49	<5.	19.	<5.	200.
GW-46	2/22/1995	D	SAMPL	DOES	GW	5133.16	15.5	1520	6.49	<5.	20.	<5.	180.
GW-46	5/23/1995	D	SAMPL	DOES	GW	5133.73	12.3	1630	6.51	<5.	17.	<5.	177.
GW-46	8/9/1995	D	SAMPL	DOES	GW	5135.93	15.4	1540	6.63	<5.	25.	<5.	236.
GW-46	11/9/1995	D	SAMPL	DOES	GW	5133.39	17	1510	6.49	<5.	28.	<5.	268.
GW-46	11/9/1995	D	DUPE	DOES	GW	5133.39	17.1	1400	6.55	<5.	30.	<5.	271.
GW-46	3/7/1996	D	SAMPL	DOES	GW	5133.49	13.8	1590	6.63	<5.	32.	<5.	242.
GW-46	6/24/1996	D	SAMPL	DOES	GW	5134.19	15	1450	6.57	<5.	25.	<5.	215.
GW-46	8/28/1996	D	SAMPL	DOES	GW	5134.04	17	1290	6.5	7.	25.	<5.	216.
GW-46	8/28/1996	D	SPLIT	CORE	GW	5134.04	17	1290	6.5	<10.	29.6	<3.	241.
GW-46	11/21/1996	D	SAMPL	DOES	GW	5133.84	14.9	1430	6.32	<5.	28.	<5.	251.
GW-46	3/12/1997	D	SAMPL	DOES	GW	5133.39	13.8	1440	6.36	<5.	27.	<5.	221.
GW-46	6/24/1997	D	SAMPL	DOES	GW	5134.37	15.6	1140	6.45	<5.	27.	<5.	166.
GW-46	9/24/1997	D	DUPE	DOES	GW	5134.85	16.3	1170	6.41	<5	28	<5	214
GW-46	9/24/1997	D	SAMPL	DOES	GW	5134.85	16.6	1040	6.46	<5	26	<5	228
GW-46	11/19/1997	D	SAMPL	DOES	GW	5134.53	15.2	1020	6.52	<5	25	<5	196
GW-46	3/3/1998	D	SAMPL	DOES	GW	5133.58	13.4	1860	6.62	<5	30	<5	288
GW-46	6/2/1998	D	SAMPL	DOES	GW	5135.36	14.5	1820	6.62	<5	36	<5	212
GW-46	8/26/1998	D	SPLIT	CORE	GW	5135.41	17.1	1520	6.67	<10	39	<5	335
GW-46	8/26/1998	D	SAMPL	DOES	GW	5135.41	17.1	1520	6.67	<5	27	<5	162
GW-46	11/23/1998	D	SAMPL	DOES	GW	5134.41	14.9	1720	6.72	<5	45	<5	192
GW-46	2/18/1999	D	SAMPL	DOES	GW	5133.67	12.7	997	6.79	<5	29	n/a	253
GW-46	5/25/1999	D	SAMPL	DOES	GW	5135.05	12.6	1647	6.69	<5	37		182
GW-46	8/20/1999	D	SAMPL	DOES	GW	5136.07	15.9	2530	6.82	<5	27		150
GW-46	11/11/1999	D	SAMPL	DOES	GW	5134.62	15.1	2700	6.63	<5	36		159
GW-46	2/4/2000	D	SAMPL	DOES	GW	5133.84	14	2900	6.78	<5	33		149
GW-46	2/4/2000	D	SPLIT	STDL	GW	5133.84	14	2900	6.78	<10	37.1		183
GW-46	5/9/2000	D	SAMPL	DOES	GW	5134.03	13.9	2430	6.75	<5	24		150
GW-46	8/7/2000	D	SAMPL	DOES	GW	5134.90	15.2	2350	6.71	<5	24		146
GW-46	11/9/2000	D	SAMPL	DOES	GW	5134.43	16.5	2110	6.60	<5	28		200
GW-46	2/12/2001	D	SAMPL	DOES	GW	5133.69	12.8	2010	6.84	<5	24		176
GW-46	5/23/2001	D	SAMPL	DOES	GW	5134.72	13.2	1745	6.71	<5	28		171

APPENDIX D

DATA VALIDATION REPORTS

ROUND 1: SOIL AND GROUNDWATER VALIDATION REPORTS

SDG: *D3L100414*
SDG: *D3L100408*
SDG: *D3L190390*
SDG: *D3L190405*
SDG: *D3L190419*
SDG: *D3L190461*
SDG: *D3L190464*
LSR: *R8-040018*

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DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Bill Fear – TechLaw, Inc.
Report Date: February 17, 2004
Project/Site: VB I-70 OU3
Laboratory No.: D3L100414

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, 7471A, and 7470A for Laboratory Lot No. D3L100414 from Severn Trent Laboratories, Inc. This report consists of the validation of 20 solid samples and one water sample collected on December 10, 2003, and analyzed on December 19, 23, and 29, 2003 for ICP metals; on December 24, 2003 for ICPMS (water sample only); and on December 15 and 18, 2003 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
01-VBOU3-SB-0028-A	D3L100414-001
01-VBOU3-SB-0028-B	D3L100414-002
01-VBOU3-SB-0028-C	D3L100414-003
01-VBOU3-SB-0028-D	D3L100414-004
01-VBOU3-SB-0028-E +	D3L100414-005
01-VBOU3-SB-0029-A	D3L100414-006
01-VBOU3-SB-0029-B	D3L100414-007
01-VBOU3-SB-0029-C	D3L100414-008
01-VBOU3-SB-0029-D	D3L100414-009
01-VBOU3-SB-0029-E	D3L100414-010
01-VBOU3-SB-0010-A	D3L100414-011
01-VBOU3-SB-0010-B	D3L100414-012
01-VBOU3-SB-0010-C	D3L100414-013
01-VBOU3-SB-0010-D	D3L100414-014
01-VBOU3-SB-0019-A	D3L100414-015
01-VBOU3-SB-0019-B	D3L100414-016
01-VBOU3-SB-0016-A	D3L100414-017
01-VBOU3-SB-0016-B +	D3L100414-018
01-VBOU3-SB-0016-C	D3L100414-019
01-VBOU3-SB-0016-D	D3L100414-020
01-VBOU3-RIN-0001	D3L100414-021

+ denotes full validation

Validated By: Bill Fear
Bill Fear

Reviewed By: Amy Ballow
Amy Ballow

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Samples 01-VBOU3-SB-0028-E and 01-VBOU3-SB-0016-B were randomly selected for full validation. Cursory validation was conducted on all remaining samples. The data were evaluated based on the following parameters:

Data Completeness
* Holding Times and Preservation
* Calibrations
* Blanks
* Interference Check Samples
Matrix Spike/Matrix Spike Duplicates
Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
Serial Dilution for ICP Analysis
Analyte Quantitation and Reporting Limits (full validation only)

*** All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided. However, various transcription errors and calculations errors were noted on the summary forms.

The Form 14 incorrectly indicated that sample 01-VBOU3-SB-0028-E was analyzed at a five times dilution for the 12/29/03 analysis. Additionally, the Form 14 for the 12/23/03 ICP analysis should only have indicated that sample 01-VBOU3-SB-0010-A was analyzed at a 10 times dilution for zinc, not all analytes.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficient for mercury was greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

The rinsate sample, 01-VBOU3-RIN-0001, reported a detected result for iron at 220 ug/L. Qualification was not necessary because the sample results for iron were above the blank action levels (greater than the RL and five times the rinsate blank value).

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

The aluminum, calcium, iron, and magnesium concentrations in the full validation sample 01-VBOU3-SB-0028-E were less than the ICSA values and no action was required. However, the results for iron in the full validation sample 01-VBOU3-SB-0016-B exceeded the ICSA value of 200 ppm.

The following non-detected sample result was qualified as estimated (UJ) because the iron result was greater than the ICSA value and the absolute value of the associated element was greater than the MDL in the ICSA analysis:

- Beryllium in sample 01-VBOU3-SB-0016-B

Beryllium was reported in the ICSA at –6.3 ug/L, which exceeds the MDL of 0.41 ug/L. Non-detected results are qualified as estimated for negative ICSA values. No action was required for additional analytes reported above the IDL in the ICSA, as the sample results were greater than five times the ICSA value.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed solid sample 01-VBOU3-SB-0016-B for ICP metals and mercury analyses and on solid sample 01-VBOU3-SB-0028-A for mercury analyses. Various water MS/MSD analyses were performed on samples from other SDGs for ICP metals and mercury analyses.

The following non-detected sample result was qualified as rejected (R) because the associated spike recoveries at 10% and 6.9% were less than 30%:

- Antimony in sample 01-VBOU3-RIN-0001

The following detected sample result was qualified as estimated (J) because the associated spike recovery at 131% was greater than 125%:

- Iron in sample 01-VBOU3-RIN-0001

The following sample results were qualified as estimated (J/UJ) because the spike recoveries were less than 75%, but greater than 30%:

- Antimony (35%/33%) and zinc (60%) in all solid samples
- Mercury (59%/31%) in samples 01-VBOU3-SB-0010-D, 01-VBOU3-SB-0019-A, 01-VBOU3-SB-0019-B, 01-VBOU3-SB-0016-A, 01-VBOU3-SB-0016-B, 01-VBOU3-SB-0016-C, and 01-VBOU3-SB-0016-D

All other MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the un-spiked sample amount was greater than 4 times the spike value and the recoveries were no applicable.

The laboratory was evaluating the spike recoveries against the laboratory QC limits. As a result, the laboratory indicated that several analytes were outside the laboratory percent recoveries QC limits. No action was taken on these results because the recoveries were within 75-125%. Additionally, antimony was not flagged as being outside QC limits in the MS/MSD of sample 01-VBOU3-SB-0016-B because the recoveries of 35% and 33% were within the laboratory limits of 20-200%. Additionally, the water recovery of iron was not flagged at 131%, as this recovery was also within the laboratory limits of 52-155% in a matrix spike analysis on a sample from another SDG.

Post-digestion spike recoveries were not provided for antimony, iron and zinc. The laboratory did provide a post digestion spike for the water ICPMS analysis. Beryllium was outside QC limits in this analysis. No action is taken based on post-digestion results. Additionally beryllium was within 75-125% in the pre-digestion spike analysis.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected. Additionally, recoveries for detected results were calculated using actual results rather than the rounded results reported on the summary Form 5A.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD RPDs.

The following sample results are qualified as estimated (J/UJ) because the MS/MSD RPD at 58% exceeded 35% in the MS/MSD analysis of sample 01-VBOU3-SB-0016-B:

- Mercury in samples 01-VBOU3-SB-0010-D, 01-VBOU3-SB-0019-A, 01-VBOU3-SB-0019-B, 01-VBOU3-SB-0016-A, 01-VBOU3-SB-0016-B, 01-VBOU3-SB-0016-C, and 01-VBOU3-SB-0016-D

The laboratory also indicated that the RPD mercury from the MS/MSD analyses of sample 01-VBOU3-SB-0028-A exceeded criteria. However, the RPD of 21% was less than the soil validation limit of 35% and no action was taken.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses for both matrices. All recoveries were within the laboratory QC limits for the solid analysis and within 80-120% for the water analysis. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on solid sample 01-VBOU3-SB-0016-B and on a water sample from another SDG.

The following detected sample results were qualified as estimated (J) because the serial dilution %D exceeded 10% for analyte concentrations greater than 50 times the MDLs:

- Barium in all solid samples

All other %Ds in the solid serial dilution were less than 10% or the sample result was less than 50 times the MDL.

It appears that arsenic and barium may have exceeded serial dilution criteria in the water analysis. However, no action was taken, as these analytes were non-detected in the water sample 01-VBOU3-RIN-0001.

No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. No calculation or transcription errors were found. However, although the laboratory reported percent moisture values, the results were not adjusted for dry weight.

The result for zinc in sample 01-VBOU3-SB-0010-A was reported from a 10x dilution. The result and reporting limit were correctly reported.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

U J - The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

NR - Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

BATCH: D3L100414

List all analytes which do not meet holding time criteria

	Sample ID 01-VB043-SB-	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	*CN Analysis Date	Analysis Date/s	No. of Days Past Holding Time	Action
1	0028-A	Soil	No	12/10/03	12/19,29,03	12/18			-0-	None
	0028-B									
	0028-C									
	0028-D									
Soil →	0028-E									
	0029-A									
	0029-B									
	-C									
	-D									
	-E									
	0010-A				①					
12	-B									
	-C									
	-D									
	0018-A									
	-B									
	0016-A									
Foil →	-B									
	-C									
	-D									
	RIN-0001	Rinsate	Aqu		12/19,29	12/15				
					12/24					
	ICP run 12/24 for rinsate					(Sb, Ag, Se, Cd, TL)				
	12/22 Run Al, CA, FE, Mg, K, Na									

COMMENTS ① - 10X for Zn on 0010-A run 12/23/03
note: Form 14 is incorrect for this run only zinc should be X'd

Recd 3°C

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: BWF Date:

Review By: Amy Ballow Date: 02-17-04

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

***VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.**

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

ICP & ICPMS 1.2> BATCH: D3L100414

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
						All ICV, CCV
						w/in 90-110%
						that bracket sample
						analysis
					none	

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY <75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. **If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).**

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: DJL1C0414

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
					All ICV, CCV that /
					bracket samples
					w/in 80-120%
				None	

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.9999
   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

Hg 828-E 2314.025 / 0.3 = 0.385 e39

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

III. INORGANIC ANALYSIS WORKSHEET -- BLANKS

MATRIX: Soil | H2O　　　　BATCH: D3L100414

List the highest positive AND negative blank result >=|DL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
						All ND @ RL
Rinsate						
RIN-0001						
			220	110		
Fe	Rin		~~205~~ ✓	100 mg/kg	—	none All ✓
			ug/L			

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify

One prep blank per matrix ✓　　No results reported below RL

One prep blank per batch ✓

ICB analyzed immediately after ICV ✓　　TCPms (DS) RL = 5

CCB analyzed after each CCV. ✓　　wet sample to 1.0

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

TECHLAW

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D3400414

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution. Fill samples only

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
0028-E	Iron < ICSA value			
0016-B	Fe	228	200	ppm unit

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
		—	80-120%.

CLP Protocol Only
Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

TECHLAW

IVB. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D3L100414

Note: For the CLP protocol only, report the concentration of any analytes detected in the ICSA solution > |IDL | that should not be present (apply only to samples with elements identified at concentrations above the ICSA on the previous page).

Analyte	ICSA Result	Action	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result
K	-846	≥423	1400 —					
Ba	-1.0		↑					
Be	-6.3	UJ	ND					
Cd	-1.6	—	ND					
Cr	43	2.15	7.6 —					
Cu	-11.9		↑					
Pb	5.5		↑					
Mn	10.9		↑					
Ni	—							
Ag	2.5	—	ND					
Zn	11.7		↑					

Actions:

If the ICSA value > the positive IDL:

1. For non-detected results, no action is taken.
2. Estimate (J) all detected results < = 5*ICSA.

If the ICSA value < -IDL:

1. Estimate (J) detected results < = 5* |ICSA|.
2. Estimate (UJ) non-detected results.

TECHLAW

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: H2O | Soil BATCH: ~~B~~ D3L100414

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
0066-B	Hg	0.576	—	0.833	62%	J/UJ	Batch 2 lab has 55
		0.286	—	↓	34 31	J/UJ	Soils 31
	Sb.	17.4		46.5	35	J/UJ	All Soils w/in lab limits
	Sb.	16.3		↓	33		20-200
	Zn	832	54	49.5	157%	J/UJ	Soils
0025-A	Hg	[illegible]	[illegible]	MS	Flagged	[illegible]	%R 76% > 75%
							no action
Waters on other SDGs							
	D3L002941-001			ICP			
	Fe	2020	710	1000	131	J	Rinsate
	D3L150203-004						
	Sb	<1.36		40	10	R	Rinsate
	Sb	3.06		40	8		1.6 to 64
	Note: Re & As			Flagged for		H2O	but %Rs
	w/in 75-125%						
	D3L090337-001			Hg H2O		@	80% flagged no action

75%

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS A post spike for ICP MS (H2O) only
Re @ 67% is ↓ Re 77% ~~[illegible]~~ in
pre spike - no action

Various > UJs

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Use 75-125%
not lab limits

Note: lab is flagging based on their limits

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

Various %Rs w/ Sample Results
ND are incorrect. Appears lab
is using found value is sample result
even though reporting ND.

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TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: Soil / H2O   BATCH: D3L004I4

Batch 2

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
C016B	Hg	0.516	0.286	58%		J/UJ	~~All~~ Soils batch
MS/MSD							1 2
							10-D
							12 A,B
							16 A-D
C024A	Hg	0.653	0.407	21%	————		<35% soil limit
							no action required
							as is.

COMMENTS

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|
Include outliers for field duplicates (if applicable)

Note

A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX: H2O/Soil BATCH: 0320041[illegible]

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
H2O						w/in 50-120%
Soil						w/in lab limits
						Hg soil 4.98 X 0.05 = 0.83 / 0.3

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

	PERCENT RECOVERY			
1. AQUEOUS	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

Soil use lab limits

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

TECHLAW

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: Soil / H2O BATCH: D3L100414

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
K	460	23000	—	—	—		< 50*
16-5 Ba	0.37	18.5	15614	17645	13!	J	all Soil
H2O Rev							
As	0.12	0.6	36.6	40.8	11.5	—	NO
Be	0.032	1.6	9.4	12.5	34	—	"

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected **and sample results may be biased low.**

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: B3L100414

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

Results not corrected for % moisture
In case nors. that not corrected d/s

Calcium ~~0028-E should be 7500 not 2400~~
~~Rc 75.03~~ ~~x come was CA or~~
~~sample size 1.01 · 7428~~

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

10x Zinc - 10-A

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes No NA

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes No NA not quarterly etc not CLP

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

Notes actual sample size 7.01 used to calc results

COMMENTS Soils 1g → 100ml Hg 0.3g → 50ml

Form 13

Form 14 12/13/03 10x run for 10-A should only X Zinc.

0028-E has 5x on 12/19 run only 1X.
Raw run has 1X raw reflects 1X

~~Cal Raw 75.03 x100~~ K Run 23.91 x100 = 2400

Hg RL $\frac{0.2 \times 0.05}{0.3} = 0.033$

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DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Ken Schroeder – TechLaw, Inc.
Report Date: February 17, 2004
Project/Site: VB I-70 OU3
Laboratory No.: D3L110408

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, 7471A, and 7470A for Laboratory Lot No. D3L110408 from Severn Trent Laboratories, Inc. This report consists of the validation of 20 solid samples and one water sample collected on December 10 and 11, 2003 and analyzed on December 16-28, 2003 for ICP metals; on December 19, 2003 for ICPMS metals (water sample only); and on December 15-18, 2003 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
01-VBOU3-SB-0020-A	D3L110408-001
01-VBOU3-SB-0020-B	D3L110408-002
01-VBOU3-SB-0014-A	D3L110408-003
01-VBOU3-SB-0014-B	D3L110408-004
01-VBOU3-SB-0014-C	D3L110408-005
01-VBOU3-SB-0031-A	D3L110408-006
01-VBOU3-SB-0031-B	D3L110408-007
01-VBOU3-SB-0031-C	D3L110408-008
01-VBOU3-SB-0017-A	D3L110408-009
01-VBOU3-SB-0017-B	D3L110408-010
01-VBOU3-SB-0017-C	D3L110408-011
01-VBOU3-SB-0017-D	D3L110408-012
01-VBOU3-SB-0021-A	D3L110408-013
01-VBOU3-SB-0021-B +	D3L110408-014
01-VBOU3-SB-0021-C	D3L110408-015
01-VBOU3-SB-0018-A +	D3L110408-016
01-VBOU3-SB-0018-B	D3L110408-017
01-VBOU3-SB-0018-C	D3L110408-018
01-VBOU3-SB-0018-D	D3L110408-019
01-VBOU3-SB-0030-A	D3L110408-020
01-VBOU3-RIN-0002	D3L110408-021

+ denotes full validation

Validated By: Ken Schroeder
Ken Schroeder

Reviewed By: Amy Ballow
Amy Ballow

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Samples 01-VBOU3-SB-0021-B and 01-VBOU3-SB-0018-A were randomly selected for full validation. Cursory validation was conducted on all remaining samples. The data were evaluated based on the following parameters:

Data Completeness
* Holding Times and Preservation
* Calibrations
* Blanks
* Interference Check Samples

Matrix Spike/Matrix Spike Duplicates
* Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
* Serial Dilution for ICP Analysis
* Analyte Quantitation and Reporting Limits (full validation only)

*** All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided. However, various transcription errors were noted on the summary forms.

On Form 14 (page 197), the result for mercury in sample 01-VBOU3-SB-0021-A at 18:09 was not used and should not be indicated with an "X". Additionally, the mercury result for this sample at 18:14 should have a dilution factor of 10 rather than 1.0.

On Form 14 (page 192), sample 01-VBOU3-SB-0021-A should have a dilution factor of 1.0 rather than 5.0. Additionally, the zinc column for this sample should not have an "X", since the result for zinc was obtained from a reanalysis.

On Form 14 (page 195), sample 01-VBOU3-SB-0021-A should have a dilution factor of 1.0 rather than 5.0.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficient for mercury was greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

The rinsate sample, 01-VBOU3-RIN-0002, reported detected results for aluminum, calcium, and iron. Qualification was not necessary because the results for these analytes in the solid samples were above the blank action levels (greater than the RL and five times the rinsate blank value).

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

The aluminum, calcium, iron, and magnesium concentrations in the full validation samples were less than the ICSA values and no action was required.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on solid sample 01-VBOU3-SB-0018-A for ICP metals and mercury analyses and on solid sample 01-VBOU3-SB-0020-A for mercury analyses. MS/MSD analyses were performed on water sample 01-VBOU3-RIN-0002 for ICP metals and on a water sample from another SDG for mercury.

The following detected sample results were qualified as estimated (J) because the spike recoveries were greater than 125%:

- Manganese (174%/145%) in all solid samples

The following sample results were qualified as estimated (J/UJ) because the spike recoveries were less than 75%, but greater than 30%:

- Lead (66%/57%) and antimony (46%/45%) in all solid samples

All other MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the unspiked sample amount was greater than four times the spike value and the recoveries were not applicable.

The laboratory evaluated the spike recoveries against the laboratory QC limits. As a result, manganese and antimony were not flagged as being outside QC limits in the MS/MSD of sample 01-VBOU3-SB-0018-A because the recoveries were within the laboratory QC limits.

Post-digestion spike recoveries were not provided for manganese, lead, or antimony. No action is taken based on post-digestion results.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected. Additionally, recoveries for detected results were calculated using actual results rather than the rounded results reported on the summary Form 5A.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD RPDs. All duplicate criteria were met. No calculation errors or transcription errors were found.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses for both matrices. All recoveries were within the laboratory QC limits for the solid analysis and within 80-120% for the water analysis. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on solid sample 01-VBOU3-SB-0018-A and on water sample 01-VBOU3-RIN-0002. All serial dilution criteria were met. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. No calculation or transcription errors were found. However, although the laboratory reported percent moisture values, the results were not adjusted for dry weight.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R	-	Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
J	-	The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
U J	-	The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.
U	-	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
NR	-	Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

6020 or 6010B   7470A or 7471A   BATCH: D3L110408

List all analytes which do not meet holding time criteria

	Sample ID	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	*CN Analysis Date	Analysis Date/s	No. of Days Past Holding Time	Action
001	01-VB0U3-SB-0020-A	Soil	B	12/10/03	12/19-28/03	12/17/03			0	None
002	-B									
003	-0014-A									
004	-B									
005	-C									
006	-0031-A			12/11/03						
007	-B									
008	-C									
009	-0017-A									
010	-B									
011	-C									
012	-D									
013	-0021-A									
014	-B									
015	-C					12/18/03				
016	-0018-A									
017	-B									
018	-C									
019	-D									
020	-0030-A				22					
021	01-VB0U3-RIN-0002	Water	A		12/16-22/03	12/15/03				
					6020 on 12/19/03					

COMMENTS Temp = 3.8°C

Full validation on 014 & 016

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: Kim Schroedy   Date: 2/13/04

Review By: Amy Ballow   Date: 2-17-04

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

*VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

BATCH: D3L110408

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
					None	All within 90-110%

CCV run after CRI. every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No NA

COMMENTS

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY <75%	75-89%	90-110% ✓	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

Inorg98.xls

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: D3L110408

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
				None	All criteria met.

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.9999, 0.9999, 0.9999
   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).
2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

TECHLAW

III. INORGANIC ANALYSIS WORKSHEET -- BLANKS

MATRIX: Soil /Water BATCH: D3L110408

List the highest positive AND negative blank result >=|DL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	RL ~~IDL~~ mg/L	Blank Conc. mg/L	5 * Bl. Conc. mg/L	mg/Kg Action		Samples Affected
Al	Field BLK	0.100	0.210	1.05	105	None	✓ (ALL >5X)
Ca	↓	0.200	0.240	1.20	120	↓	✓ ↓
Fe	↓	0.100	0.420	2.10	210	↓	✓ ↓

All prep blanks and calibration blanks < RL.

NO ACTION

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify

One prep blank per matrix ✓

One prep blank per batch ✓

ICB analyzed immediately after ICV ✓

CCB analyzed after each CCV. —

COMMENTS Field blank = # 021 (01-VB043-RIN-0002)

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

TECHLAW

IVA. INORGANIC ANALYSIS WORKSHEET – ICP INTERFERENCE CHECK SAMPLE

BATCH: D3L110408

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
				All < ICSA values
				in full validation
				samples

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
		None	All within 80-120%

CLP Protocol Only
Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No NA

COMMENTS

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

IVB. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D3L110408

Note: For the CLP protocol only, report the concentration of any analytes detected in the ICSA solution > |IDL | that should not be present (apply only to samples with elements identified at concentrations above the ICSA on the previous page).

Analyte	ICSA Result	Action	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result
N/A								

Actions:

If the ICSA value > the positive IDL:
1. For non-detected results, no action is taken.
2. Estimate (J) all detected results < = 5*ICSA.

If the ICSA value < -IDL:
1. Estimate (J) detected results < = 5* |ICSA|.
2. Estimate (UJ) non-detected results.

TECHLAW

V. INORGANIC ANALYSIS WORKSHEET – PRE-DIGESTION MATRIX SPIKE

MATRIX: Soil/Water BATCH: D3L110408

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

soil

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
016	Mn	251	170	49.5	164	J+	All soils (all are detects)
↓	↓	237	↓	↓	135		
	Pb	76.8	44	49.5	66	J/UJ	All soils
	↓	72.4	↓	↓	57		
	Sb	22.7	ND	49.5	46	J/UJ	All soils
↓	↓	22.4	↓	↓	45		
							Values used above are from QC summary & differ from results obtained from raw data.
							Note: Lab QC limits are not 75-125%. Mn & Sb were not flagged.

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS Sample > 4X spike for Al, Cu, Fe.

ICP For water matrix, MS/MSD on #021. All within 75-125%.

For Hg, for soil, MS/MSD on #001, in addition to #016. For water, MS/MSD on sample from another SDG. All within 75-125%.

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: Soil / Water BATCH: D3L110408

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
						None	All criteria met.
							RPDs:
							All soils <35%
							All waters <20%

COMMENTS Use MS/MSD in place of duplicates.

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

[3]Difference = |Sample result - Duplicate sample result|

Note
A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX: Soil / Water BATCH: D3L110408

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
					None	All criteria met
						Water LCS within 80-120%
						Soil LCS within lab limits.

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

1. AQUEOUS	PERCENT RECOVERY <50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

TECHLAW

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: Soil / Water BATCH: D3L110408

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
						None	All criteria met.

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS See MS/MSD for QC sample ID.

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. METAL ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: D3L110408

1. Describe any raw data anomalies (i.e.. baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

① Form 13 shows 1.00 for all sample weights. Actual weights are on prep logs. (ICP) For Hg Form 13 shows 0.30. Actual weights are on prep logs.

② PQLs of Form 10 do not match RLs on Form 1 for the following:
Cu, Pb, Se, Tl, V

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes **No** NA

> 3 months on some ICPs.

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? **Yes** No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes **No** NA

> 3 months old.

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No **NA**

7. Were all sample results reported down to MDL if running SW-846 methods? Yes **No** NA

Reported to RL.

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? **Yes** No

COMMENTS Full validation samples:

014 – All results calculated correctly
016 – " " " "

Errors on Form 14:

① Page 197 – The Hg result at 18:09 was not used and should not be indicated with a "X".
② " " The Hg result at 18:14 should have a dil. factor of 10, not 1.0.
(These are both sample 01-VB0U3-SB-0021-A.)
③ page 192 – (Same sample) – should have dil factor of 1.0, not 5.0. Also, Zinc should not have an "X" since it was obtained from a reanalysis.
④ page 195 – (same sample) – should have dil factor of 1.0, not 5.0.

DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Amy Ballow – TechLaw, Inc.
Report Date: February 17, 2004
Project/Site: VB I-70 OU3
Laboratory No.: D3L190390

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, 7471A, and 7470A for Laboratory No. D3L190390 from Severn Trent Laboratories, Inc. This report consists of the validation of 20 solid samples and one water sample collected on December 11-12, 2003, and analyzed on December 23, 24, 29, and 30, 2003 for ICP metals; on December 24, 2003 for ICPMS (water sample only); and on December 22, 23, and 27, 2003 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
01-VBOU3-SB-0030-B	D3L190390-001
01-VBOU3-SB-0030-C+	D3L190390-002
01-VBOU3-SB-0027-A	D3L190390-003
01-VBOU3-SB-0027-B	D3L190390-004
01-VBOU3-SB-0027-C	D3L190390-005
01-VBOU3-SB-0027-D	D3L190390-006
01-VBOU3-SB-0027-E	D3L190390-007
01-VBOU3-SB-0032-A	D3L190390-008
01-VBOU3-SB-0032-B	D3L190390-009
01-VBOU3-SB-0032-C	D3L190390-010
01-VBOU3-SB-0032-D	D3L190390-011
01-VBOU3-SB-0032-E	D3L190390-012
01-VBOU3-SB-0022-A+	D3L190390-013
01-VBOU3-SB-0022-B	D3L190390-014
01-VBOU3-SB-0022-C	D3L190390-015
01-VBOU3-SB-0022-E **	D3L190390-016
01-VBOU3-SB-0009-A	D3L190390-017
01-VBOU3-SB-0009-B	D3L190390-018
01-VBOU3-SB-0009-C	D3L190390-019
01-VBOU3-SB-0009-D	D3L190390-020
01-VBOU3-RIN-0003	D3L190390-021

+ denotes full validation

Validated By: Amy Ballow

Reviewed By: Bill Fear

** Although sample 01-VBOU3-SB-0022-E was listed with an "E" on the Form 1 and in the EDD, this sample was listed with a "D" on the chain-of-custody record. The table above reflects the EDD field sample number.

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Samples 01-VBOU3-SB-0030-C and 01-VBOU3-SB-0022-A were randomly selected for full validation. Cursory validation was conducted on all remaining samples. The data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation
Calibrations
* Blanks
* Interference Check Samples
Matrix Spike/Matrix Spike Duplicates
Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
Serial Dilution for ICP Analysis
Analyte Quantitation and Reporting Limits (full validation only)

*** All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficient for mercury was greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recovery of mercury was within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery, with one exception.

The CCV analyzed on 12/23/03 at 0151 reported a percent recovery for selenium at 110.5%. This CCV was associated with samples 01-VBOU3-SB-0022-E, 01-VBOU3-SB-0009-A, 01-VBOU3-SB-0009-B, 01-VBOU3-SB-0009-C, and 01-VBOU3-SB-0009-D. No action was taken for a percent recovery less than 111%.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

The rinsate sample, 01-VBOU3-RIN-0003, reported detected results for calcium at 520 ug/L, iron at 170 ug/L, and magnesium at 200 ug/L. Qualification was not necessary because the sample results for these elements were above the blank action levels (greater than the RL and five times the rinsate blank value).

Interference Check Samples

All interference check sample percent recoveries were within acceptable limits.

The aluminum, calcium, iron, and magnesium concentrations in the full validation samples were less than the ICSA values and no action was required.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed sample 01-VBOU3-SB-0027-B (solids), 01-VBOU3-SB-0009-C (solids), 01-VBOU3-RIN-0003 (waters) and on a sample from another SDG (D3L190390-002 waters) for ICP metals and mercury analyses.

The following detected sample results were qualified as estimated (J) because the spike recovery at 329% was greater than 125%:

- Lead in all solid samples (all samples except 01-VBOU3-RIN-0003)

The following sample results were qualified as estimated (J/UJ) because the spike recoveries were less than 75% but greater than 30%:

- Antimony (35%/35%) and zinc (65%) in all solid samples (all samples except 01-VBOU3-RIN-0003)

The following non-detected sample result was qualified as rejected (R) because the spike recoveries at 14% and 3.5% were less than 30%:

- Mercury in the water sample 01-VBOU3-RIN-0003

All other MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the un-spiked sample amount was greater than 4 times the spike value and the recoveries were no applicable.

The laboratory was evaluating the spike recoveries against the laboratory QC limits. As a result, antimony was not flagged as being outside QC limits in the MS/MSD of sample 01-VBOU3-SB-0027-B because the recoveries of 35% and 35% were within the laboratory limits of 20-200%.

Post-digestion spike recoveries were not provided for lead, antimony, zinc, and mercury. No action is taken based on post-digestion results.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected. Additionally, recoveries for detected results were calculated using actual results rather than the rounded results reported on the summary Form 5A.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD RPDs.

The following sample results are qualified as estimated (J/UJ) because the RPDs for lead in the MS/MSD analyses of sample 01-VBOU3-SB-0027-B and for mercury in the MS/MSD analyses performed on a sample from another SDG exceeded 35%:

- Lead (74%) in all solid samples (all samples except 01-VBOU3-RIN-0003)
- Mercury (120%) in the water sample 01-VBOU3-RIN-0003
  (The non-detected result for mercury was ultimately qualified as rejected due to extremely low MS/MSD recoveries.)

Laboratory Control Samples

The laboratory performed laboratory control sample analyses for both matrices. All recoveries were within the laboratory QC limits for the solid analysis and within 80-120% for the water analysis. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on solid sample 01-VBOU3-SB-0027-B and on water sample 01-VBOU3-SB-0003.

The following detected sample results were qualified as estimated (J) because the serial dilution %D exceeded 10% for analyte concentrations greater than 50 times the MDLs:

- Manganese in all solid samples

All other %Ds were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. No calculation or transcription errors were found. However, although the laboratory reported percent moisture values, the results were not adjusted for dry weight.

The result for zinc in sample 01-VBOU3-SB-0022-A was reported from a 5x dilution. The result and reporting limit were correctly reported.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R	-	Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
J	-	The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
U J	-	The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.
U	-	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
NR	-	Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

BATCH: D3L190390

List all analytes which do not meet holding time criteria

	Sample ID	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	~~*CN Analysis Date~~	Analysis Date/s	No. of Days Past Holding Time	Action
-01	01-VB0U3-SB-0030-B	Soil	None	12-11-03	12-23 / 12-24, 12-29 / 12-30	12-22 12-23, 12-29		0	None	None
* -02	01-VB0U3-SB-0030-C									
-03	01-VB0U3-SB-0027-A									
-04	01-VB0U3-SB-0027-B									
-05	01-VB0U3-SB-0027-C									
-06	01-VB0U3-SB-0027-D									
-07	01-VB0U3-SB-0027-E									
-08	01-VB0U3-SB-0032-A			12-12-03						
-09	01-VB0U3-SB-0032-B									
-10	01-VB0U3-SB-0032-C									
-11	01-VB0U3-SB-0032-D									
-12	01-VB0U3-SB-0032-E									
* -13	01-VB0U3-SB-0022-A									
14	01-VB0U3-SB-0022-B									
-15	01-VB0U3-SB-0022-C									
16	01-VB0U3-SB-0022-E (D)**									
17	01-VB0U3-SB-0009-A									
18	01-VB0U3-SB-0009-B									
19	01-VB0U3-SB-0009-C									
20	01-VB0U3-SB-0009-D	Soil								
21	01-VB0U3-RIN-0003 (Rinsate)	Water	HNO3	12-22-03	12-24 ~~12-24~~ 12-23	12-22-03		0		

COMMENTS 6010B / 7471A-Hg Al, Ca, Fe, Mg, K, Na = 12/29/03, 12/30/03, 12-24-03 others 12-23-03 / Hg = 12-22-03, 12-23-03, 12-27-03

Temp 2.0°C 2 Full - others cursory

** Listed as 0022D - on COC, but 0022E on Form I / ~~Use COC~~ 0022E on EDD

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

* Full

Validated by: Amy Ballou Date: 02-09-04

Review By: [signature] Date:

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

*VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

BATCH: D3L190390

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
ICPs	ICV			90-110%	None	All w/in criteria
	CCV's				↓	except J
Se	~~CCV6~~ (CCV 15 low)			110.5 ↑	- No Action	0022-E/0009-A/0009-B, 0009-C, 0009-D
	12-23-03	(0151) last std		(<111)	<111%	

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No Non CLP

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No Non CLP

COMMENTS

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: D3L190390

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
Hg ICV CCVs			80-120%	None	All w/in criteria

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.9999 - 12

   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No Non-CLP
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

TECHLAW

III. INORGANIC ANALYSIS WORKSHEET -- BLANKS

MATRIX: Soil / Water BATCH: D3L190390

List the highest positive AND negative blank result >=|DL| below. Use one worksheet for soil matrix and another for water matrix. .

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
ICP	MB's	All	ND -	No Action	- None	
Hg						No Action
ICP	ICBs	All	U -	No Action	- None	
Hg	CCBs					
Rinsate						
-021	Rins.		µg/L × 1/10 = mg/kg × 5 = 0.5			
01-VB0U3-RIN	Ca	200	520 µg/L	~~mg/kg 2.0 mg/kg~~ 260	None	All >5× No Action
-0003	Fe	100	170	85 mg/kg	↓	↓
	Mg	200	200	100 mg/kg	↓	↓

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify

One prep blank per matrix ✓

One prep blank per batch ✓

ICB analyzed immediately after ICV ✓

CCB analyzed after each CCV. ✓

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D3L190390

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Fulls

Sample ID	Analyte	Sample Result	ICS Value	Comments
-02	✓ -	Okay		
-013	✓ -	Okay		Cked Full only ✓

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
			80-120% - All ✓

CLP Protocol Only

Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

TECHLAW

IVB. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D3L190390

Note: For the CLP protocol only, report the concentration of any analytes detected in the ICSA solution > |IDL| that should not be present (apply only to samples with elements identified at concentrations above the ICSA on the previous page).

Analyte	ICSA Result	Action	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result
NA								
					NA			

Actions:

If the ICSA value > the positive IDL:

1 For non-detected results, no action is taken.

2 Estimate (J) all detected results < = 5*ICSA.

If the ICSA value < -IDL:

1 Estimate (J) detected results < = 5* |ICSA|.

2 Estimate (UJ) non-detected results.

TECHLAW

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: Soil / Water BATCH: D3L190390

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
-004	Pb MS	93.5	40	49.5	108 ✓		RPD = 74% ↑
Solids	MSD	203			329 ↑	J+	Solids only - All > RL = All "J"
	Sb MS	17.3	ND	49.5	35 ↓	J/UJ	RPD ✓ (Not Flagged w/in 20-200 lab)
	MSD	17.5			35 ↓		
	Zn MS	166	130		65 ↓	J/UJ	RPD = 11 ✓
	MSD	186			105 ✓		
Hg ✓ -19	✓ Hg	- Okay - Solids					
-021 Water	All w/in ICP-MS	75-125 ?	RPD's ✓				All Water ✓
~~-19 Hg~~							
Another SDG Water-022	Hg	0.00069	ND	0.005	14 ↓↓	J/R	— Water
		0.00017	ND		35 ↓↓		
Post-digest.							
	Sb =	94.4	Okay				Not all %R reproducible
	As	90.4	No other forms				see comment in report
	Be	98.5					Okay
	Cd	95.7					
	Th =	97					
							Spikes w/ ND sample value - %R stuff

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS Al, Fe, Mn } sample conc > 4 x spike - No Action

No Post-dig results for Pb, Sb, Zn, + Hg - No Action

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:
Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note
If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: Soil /Water BATCH: D3L190390

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
1-004	Pb			74%			RPD for MS/MSD used
Solid							All other ✓
Another SDG	Hg			120%			
Water							

COMMENTS

Actions:

1. AQUEOUS

If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.

If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID

If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.

If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|

Include outliers for field duplicates (if applicable)

Note

A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

TECHLAW

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX: Soil / Water BATCH: D9L190390

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	%.R	Action	Samples Affected
LCS-Solid	ICP			w/in Solid limits	None	w/in criteria
↓	Hg/Hg			↓		
LCS-Water	Hg			80-120 ✓	None	w/in criteria both 80-120% ✓
↓	ICP			↓	↓	↓ ✓ + Lab limits ✓

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

	PERCENT RECOVERY			
1. AQUEOUS	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: Soil /Water BATCH: D3L190390

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
		µg/L	µg/L	µg/L			
-004 Solid - Mn	0.54µg/L	27	6535	7238	10.8	- J	- All Soils - Mn All result(+)

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: D3L190390

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

Full Validation -02 ✓

-13 - Zinc = ×5 = other ✓

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

✓

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes No NA

9/6/03 8/1/03 10/6/03

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NA

9-6-03 / 8-1-03

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes No NA

032603 4-2-03 - Not w/in 3 month > // 8-2203 ✓

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

COMMENTS Water = 50ml -> 50ml

ICP Hg 10ml -> 10ml

Soil 1.0g -> 100ml

ICP

Hg - 0.30g -> 50ml

DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Lisa Tyson – TechLaw, Inc.
Report Date: February 17, 2004
Project/Site: VB I-70 OU3
Laboratory No.: D3L190405

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B and 7471A for Laboratory Lot No. D3L190405 from Severn Trent Laboratories, Inc. This report consists of the validation of 20 solid samples collected on December 12, 2003, and analyzed on December 23, 27, 28, and 30, 2003 for ICP metals and on December 23 and 27, 2003 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
01-VBOU3-SB-0008-A	D3L190405-001
01-VBOU3-SB-0008-B	D3L190405-002
01-VBOU3-SB-0008-C	D3L190405-003
01-VBOU3-SB-0008-D	D3L190405-004
01-VBOU3-SB-0002-A +	D3L190405-005
01-VBOU3-SB-0002-B	D3L190405-006
01-VBOU3-SB-0002-C	D3L190405-007
01-VBOU3-SB-0002-E **	D3L190405-008
01-VBOU3-SB-0006-A	D3L190405-009
01-VBOU3-SB-0006-B	D3L190405-010
01-VBOU3-SB-0006-C +	D3L190405-011
01-VBOU3-SB-0006-D	D3L190405-012
01-VBOU3-SB-0007-A	D3L190405-013
01-VBOU3-SB-0007-B	D3L190405-014
01-VBOU3-SB-0007-C	D3L190405-015
01-VBOU3-SB-0007-D	D3L190405-016
01-VBOU3-SB-0007-E	D3L190405-017
01-VBOU3-SB-0015-A	D3L190405-018
01-VBOU3-SB-0015-B	D3L190405-019
01-VBOU3-SB-0015-C	D3L190405-020

+ denotes full validation

Validated By: Lisa Tyson

Reviewed By: Amy Ballow

** Although sample 01-VBOU3-SB-0002-E was listed with an "E" on the Form 1 and in the EDD, this sample was listed with a "D" on the chain-of-custody record. The table above reflects the EDD field sample number.

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Samples 01-VBOU3-SB-0002-A and 01-VBOU3-SB-0006-C were randomly selected for full validation. Cursory validation was conducted on all remaining samples. The data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation
* Calibrations
* Blanks
* Interference Check Samples
Matrix Spike/Matrix Spike Duplicates
* Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
Serial Dilution for ICP Analysis
Analyte Quantitation and Reporting Limits (full validation only)

*** All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficient for mercury was greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

The aluminum, calcium, iron, and magnesium concentrations in the full validation samples were less than the ICSA values and no action was required.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed solid sample 01-VBOU3-SB-0007-D for ICP metals and mercury analyses. Additional mercury MS/MSD analyses were also provided from another SDG.

The following detected sample results were qualified as estimated (J) because the associated spike recoveries at 190% and 130% were greater than 125%:

- Copper in all samples

The following sample results were qualified as estimated (J/UJ) because the associated spike recoveries at 41% in the MS/MSD were less than 75%, but greater than 30%:

- Antimony in all samples

All other MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the un-spiked sample amount was greater than 4 times the spike value and the recoveries were no applicable.

The laboratory was evaluating the spike recoveries against the laboratory QC limits. Antimony was not flagged as being outside QC limits in the MS/MSD because the recoveries of 41% were within the laboratory limits of 20-200%.

Post-digestion spike recoveries were not provided. No action is taken based on post-digestion results.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected. Additionally, recoveries for detected results were calculated using actual results rather than the rounded results reported on the summary Form 5A.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated from the MS/MSD RPDs. All RPDS were within QC limits. Summary forms and raw data were evaluated.

It should be noted that the RPDs were not calculated by the laboratory for aluminum, cadmium, iron, manganese, or zinc. These RPDs were evaluated using raw data and criteria were met.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses. All recoveries were within the laboratory QC limits for the solid analysis. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on solid sample 01-VBOU3-SB-0007-D.

The following detected sample results were qualified as estimated (J) because the serial dilution %D exceeded 10% for analyte concentrations greater than 50 times the MDLs:

- Chromium in all samples

The serial dilution result for chromium was not flagged by the laboratory. All other %Ds in the solid serial dilution were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

The case narrative indicated that manganese was outside criteria in the serial dilution; however, this information appears incorrect because the manganese criteria were met.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. No calculation or transcription errors were found. However, although the laboratory reported percent moisture values, the results were not adjusted for dry weight.

The result for zinc in sample 01-VBOU3-SB-0006-C was reported from a 5x dilution. The result and reporting limit were correctly reported.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

U J - The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

NR - Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

BATCH: D3L190405

List all analytes which do not meet holding time criteria   other metals

	Sample ID	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	~~*Hg CVAA~~ Analysis Date	Hg ~~*CN~~ Analysis Date	Analysis Date/s	No. of Days Past Holding Time	Action
1	01-VBA03-SB-0003-A	S	B	12/11/03	12/23/1/07	12/30	12/23/03		0	
2	-B									
3	-C									
4	-D									
5	* -0002-A									
6	-B									
7	-C									
8	-E									
9	-0006-A									
10	-B									
11	* -C									
12	-D									
13	-0007-A									
14	-B									
15	-C									
16	-D									
17	-E									
18	-0015-A				12/23/12/07	1/30	12/23/03			
19	-B				12/23	1/30				
20	-C									

COMMENTS

3.1°C @ 2-6°C -ok   * Full Samples

20 Soil

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: L. Tyson   Date:

Review By: Amy Ballow   Date: 02-18-04

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

*VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET – ICP CALIBRATIONS

BATCH: 03490405

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
Calib Met						

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS CRDL OK

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

Inorg98.xls

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: 03L170403

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
Criteria		Met ✓			

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.99980 ✓
   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

TECHLAW

III. INORGANIC ANALYSIS WORKSHEET -- BLANKS

MATRIX: S

BATCH: 03L190405

List the highest positive AND negative blank result >=|DL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
Prep –	ND	to the	RL	✓		
ICB's –	ND	to the	RL			
CCB's –	ND	to the	RL			
			✓			

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify

One prep blank per matrix

One prep blank per batch

ICB analyzed immediately after ICV

CCB analyzed after each CCV.

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

TECHLAW

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: 03L190905

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution. 12/30 - 6539 sample 11/26/1130 0905

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
ok				

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
Certain	met	/	

CLP Protocol Only
Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS

Actions:

	PERCENT RECOVERY			
	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

TECHLAW

IVB. INORGANIC ANALYSIS WORKSHEET – ICP INTERFERENCE CHECK SAMPLE

BATCH: 03L190405

Note: For the CLP protocol only, report the concentration of any analytes detected in the ICSA solution > |IDL| that should not be present (apply only to samples with elements identified at concentrations above the ICSA on the previous page).

Analyte	ICSA Result	Action	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result
N/A								

Actions:

If the ICSA value > the positive IDL:

1 For non-detected results, no action is taken.
2 Estimate (J) all detected results < = 5*ICSA.

If the ICSA value < -IDL:

1 Estimate (J) detected results < = 5* |ICSA|.
2 Estimate (UJ) non-detected results.

TECHLAW

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: S BATCH: 0342904203

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.
If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
#16 ms	Cu	130	83	25	188(190)	J	All
msd		115	83	25	128(130)	↓	↓
ms	Sb	50.8	50 ND	50	41.6	J/UJ	All
msd		20.4	50 ND	50	40.8	↓	↓
	V msd @ 125% - ok rounded for ms						
	RPDs ok						

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS

Note: Case narrative indicated that Ca out in ms/msd - but Ca not evaluated for soils - no qual (Also indicates Cu, but not Sb)

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:
Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note
If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: S BATCH: 03490465

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
#16 MS	/MSD	RPDs	ok	/			

COMMENTS RPDs not calculated for Al Cd Fe, Mn or Zn
Evaluated by raw # RPDs ok

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|
Include outliers for field duplicates (if applicable)
Note
A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

TECHLAW

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX: S BATCH: 03419040

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
			✓			
Criteria Met						

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

PERCENT RECOVERY NO QC

1. AQUEOUS	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

TECHLAW

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: S

BATCH: D3L190405

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
Cr	2.1 ✓	105 ✓	110.25	121.49	10.2	J	All - Not Flagged

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS Note: Case narrative indicates that Mn was out - not so.

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: 03C190405

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

None

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

None

3. Were ICP linear ranges obtained wi~~thin 3 months of~~ and preceding, the sample analyses? Yes No NA

4. Were ICP interelement corrections obtained ~~within 12 months of~~, and preceding, the sample analyses? Yes No NA

5. Were instrument detection limits present, ~~found to~~ be less than or equal to the CRDL, ~~and obtained within 3 months of~~, and preceding, the sample analyses? Yes No NA

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

COMMENTS

Various results reported @ DZ/

#5 - @ 1x
#11 - 2 @ 5x

RESULTS NOT Adjusted For digest

DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Bill Fear – TechLaw, Inc.
Report Date: February 17, 2004
Project/Site: VB I-70 OU3
Laboratory No.: D3L190419

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, 7471A, and 7470A for Laboratory Lot No. D3L190419 from Severn Trent Laboratories, Inc. This report consists of the validation of 20 solid samples and one water sample collected on December 18, 2003, and analyzed on December 30, 2003 and January 5, 7 and 15, 2004 for ICP metals; on January 7, 2004 for ICPMS (water sample only); and on December 30 and 31, 2003 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
01-VBOU3-SB-0004-A +	D3L190419-001
01-VBOU3-SB-0004-B	D3L190419-002
01-VBOU3-SB-0004-C	D3L190419-003
01-VBOU3-SB-0004-D	D3L190419-004
01-VBOU3-SB-0003-A	D3L190419-005
01-VBOU3-SB-0003-B	D3L190419-006
01-VBOU3-SB-0003-C	D3L190419-007
01-VBOU3-SB-0003-D	D3L190419-008
01-VBOU3-SB-0002-D	D3L190419-009
01-VBOU3-SB-0022-D	D3L190419-010
01-VBOU3-SB-0005-A	D3L190419-011
01-VBOU3-SB-0005-B	D3L190419-012
01-VBOU3-SB-0005-C	D3L190419-013
01-VBOU3-SB-0005-D +	D3L190419-014
01-VBOU3-SB-0034-A	D3L190419-015
01-VBOU3-SB-0034-B	D3L190419-016
01-VBOU3-SB-0034-C	D3L190419-017
01-VBOU3-SB-0034-D	D3L190419-018
01-VBOU3-SB-0034-E	D3L190419-019
01-VBOU3-SB-0034-F	D3L190419-020
01-VBOU3-RIN-0004	D3L190419-021

+ denotes full validation

Validated By: Bill Fear
Bill Fear

Reviewed By: Amy Ballow
Amy Ballow

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Samples 01-VBOU3-SB-0004-A and 01-VBOU3-SB-0005-D were randomly selected for full validation. Cursory validation was conducted on all remaining samples. The data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation
* Calibrations
* Blanks
* Interference Check Samples
Matrix Spike/Matrix Spike Duplicates
* Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
Serial Dilution for ICP Analysis
Analyte Quantitation and Reporting Limits (full validation only)

* **All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficient for mercury was greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method blanks. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

A calibration blank from the 12/30/03 ICP analysis was contaminated with iron at 201.8 ug/L and with zinc at 59.41 ug/L, which were above the reporting limits. No action was required because the associated sample results were greater than 10 times the blank value or the sample was reanalyzed for the effected analyte. Zinc was reported from the 01/15/04 analysis for samples 01-VBOU3-SB-0004-B, 01-VBOU3-SB-0003-B, 01-VBOU3-SB-0003-C, VBOU3-SB-0005-B, and 01-VBOU3-SB-0005-C.

The rinsate sample, 01-VBOU3-RIN-0004, reported detected results for aluminum at 120 ug/L, calcium at 270 ug/L, iron at 180 ug/L, and lead at 3 ug/L. Qualification was not necessary, as the sample results for these analytes were above the blank action levels (greater than the RL and five times the rinsate blank value).

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

The aluminum, calcium, iron, and magnesium concentrations in the full validation samples 01-VBOU3-SB-0004-A and 01-VBOU3-SB-0005-D were less than the ICSA values and no action was required.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed solid sample 01-VBOU3-SB-0004-A for ICP metals and mercury analyses Water MS/MSD analyses were performed on samples from other SDGs for ICP metals and mercury analyses.

The following detected sample results were qualified as estimated (J) because the associated spike recoveries were greater than 125%:

- Silver (131%/138%) in samples 01-VBOU3-SB-0004-A, 01-VBOU3-SB-0003-A, and 01-VBOU3-SB-0005-A
- Barium (134%), manganese (129%/179%), and lead (315%/375%) in all solid samples

The following sample results were qualified as estimated (J/UJ) because the spike recoveries at 56% and 52% were less than 75%, but greater than 30%:

- Antimony in all solid samples

All other MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the un-spiked sample amount was greater than 4 times the spike value and the recoveries were no applicable.

The laboratory was evaluating the spike recoveries against the laboratory QC limits. As a result, the laboratory flagged the water recovery for aluminum at 122% as outside the laboratory QC limits of 83-119%. No action was taken as the recovery was within the validation limits of 75-125%. Additionally, antimony, silver, and manganese were not flagged as being outside QC limits in the MS/MSD of sample 01-VBOU3-SB-0004-A because the recoveries were within the laboratory limits.

The laboratory only provided a post digestion spike for the water ICPMS analysis. No action is taken based on post-digestion results.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected. Additionally, recoveries for detected results were calculated using actual results rather than the rounded results reported on the summary Form 5A.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated from the MS/MSD RPDs. All RPDS were within QC limits.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses for both matrices. All recoveries were within the laboratory QC limits for the solid analysis and within 80-120% for the water analysis. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on solid sample 01-VBOU3-SB-0004-A and on a water sample from another SDG.

The following detected sample results were qualified as estimated (J) because the serial dilution %D exceeded 10% for analyte concentrations greater than 50 times the MDLs:

- Cadmium in samples 01-VBOU3-SB-0004-A, 01-VBOU3-SB-0004-C, VBOU3-SB-0004-D, 01-VBOU3-SB-0005-A, and VBOU3-SB-0005-D

The serial dilution result for manganese was not flagged by the laboratory. All other %Ds were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. No calculation or transcription errors were found. However, although the laboratory reported percent moisture values, the results were not adjusted for dry weight.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R	-	Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
J	-	The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
U J	-	The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.
U	-	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
NR	-	Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

BATCH: 0312190419

List all analytes which do not meet holding time criteria

Sample ID 01-VB043	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	*CN Analysis Date	Analysis Date/s	No. of Days Past Holding Time	Action
Full → -SB-0004 A	Soil	Ice	12/18/03	1/5, 12/30	12/31			-0-	None
B				1/15					
C									
D									
-SB-0003 -A									
B				1/15					
C				1/15					
D									
~~E~~						No sample ours			
-SB-0002 -~~E~~D									
-SB-0022 -~~E~~D									
-SB-0005 -A									
B				1/15					
C				1/15					
Full → D									
-SB-0034-A									
-B									
-C									
-D									
-E									
-F									
RSW-0004	H2O	A		1/7	12/30		3 runs for H2O		
							ck on 1/7		
							ICP, ICPMS		
							& Trace		

COMMENTS 2/2

20 Soil 1 H2O 1/5 - cations & Zn

Zn run on 1/15/04 for 0004-B, 3B, 3C, 5B & 5C

~~[illegible] 1/5~~

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: [signature] Date:

Review By: [signature] AB Date: 02-17-04

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE	
		AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

***VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.**

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

BATCH: D3L180419

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
K -115	CCV	44940	50000	89.9	[illegible]	@ 90 -03 on--
						✓

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: 0324 9049

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
				—	All w/in 80-120

1. Were the correct number of standards and blanks used to calibrate the instrument?	Yes No
2. Is the initial calibration correlation coefficient > 0.995?	Yes No ~~0~~ 1-3 / 0.99953
If no, list affected analytes and samples:	1 Hg / 1 Cal
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only)	Yes No
4. CCV run after CRA, every ten samples and at end of sequence?	Yes No
COMMENTS	

Actions:

	<65%	65-79%	80-120%	121-135%	>135%
	PERCENT RECOVERY				
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

TECHLAW

III. INORGANIC ANALYSIS WORKSHEET -- BLANKS

MATRIX: ~~X~~ H2O / Solid BATCH: 03C190419

List the highest positive AND negative blank result >=|IDL| below. Use one worksheet for soil matrix and another for water matrix.

12/30

Analyte	ICB CCB PB/MB	IDL	Blank Conc. ug/L	5 * Bl. Conc.	Action	Samples Affected
Fe	CCB 5		201.8 ✓	1009	—	All > 10x
Zn	" ✓		59.41 ✓	29.7	—	All > 10x or rerun
Al	Rinsate		120	60	—	All ↑ 10x
Ca			270	135	—	"
Fe			180		—	All ↑
Pb.			3	1.5	—	"
	Sample < 10x Zn blank value rerun					
					4-B ✓	
					3 B ✓	bracketed by
					3 C ✓	
					5 B ✓	
					5 C ✓	

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify Results to RL

One prep blank per matrix ✓ All w/s

One prep blank per batch

ICB analyzed immediately after ICV

CCB analyzed after each CCV.

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

No actions

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D3C180419

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Full validation samples

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
0005-D				
0006-A			None	> ICSA

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
		—	All w/in 80-120%

CLP Protocol Only
Were Interference Check Samples run at the beginning and end of each ~~sample~~ once analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No ✓

COMMENTS

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

TECHLAW

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: Soil / H2O BATCH: D3C190419

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
0024-A	Ag	673	2.1	5.05	131	J	11-A 13A 5A
		708			135		
	Ba	426	160	202	130	J	All soils
	Ca	12000	5600	5050	127	J	All soils Not qualified for soils
	Mn	243	160	50.5	129	J	All soils
		269			174	✓	
	Pb	352	190	50.5	315	J	All soils
		343			375	✓	
	Sb	28.2	—	50.5	56	J/UJ	All soils 58
					52	✓	
							lab flagged
H2O	Sb				122%	(83-119)	none with 2525 ✓
Ag, Ca, Mn & Sb							% Rec using actual
not flagged by lab							Form 5 amounts
w/in lab limits							not reported
							rounded amount
							or no. value

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS

ICP, Hg H2O on another SDGs

Al, Cu, Fe, Zn >4x

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

PERCENT RECOVERY

	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

post only run for the H2O ICPMS

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: Soil(s) BATCH: D3L180419

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
						None out	
							MS/MSD RPD

COMMENTS

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|
Include outliers for field duplicates (if applicable)
Note
A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX: Solid / H2O BATCH: D3L190419

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
					None out	

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

	PERCENT RECOVERY			
1. AQUEOUS	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS (Solids)	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

TECHLAW

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX:______________________ BATCH: D3[illegible]

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
K	460	23000			–		<50*
Cd	0.27	13.5	31.6	28.1	11.1	J	4A, 4C, 4D
					✓		5A, 5D

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS Cd not flagged

Actions:
Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: D3419J449

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

None.

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

W/in Range no D-Ls

not quarterly

3. Were ICP linear ranges obtained ~~within 3 months~~ of, and preceding, the sample analyses? Yes No NA

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NA

not quarterly

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained ~~within 3 months~~ of, and preceding, the sample analyses? Yes No NA

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

to RLs

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

ND % moisture

COMMENTS

Form 13 ICP SI → 100

Hg 0.3 → 50

(1026)

Form 14 SD-0004-D 1x + 5x Al, Ca, Fe, Mg, K, Na, Zn X on both

~~Form 1 individually~~ from 1x

(1026.2 — SD ?

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DATA VALIDATION REPORT

To:	Jennifer Walter – Syracuse Research Corporation
From:	Amy Ballow – TechLaw, Inc.
Report Date:	February 17, 2004
Project/Site:	VB I-70 OU3
Laboratory No.:	D3L190461

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, 7471A, and 7470A for Laboratory No. D3L190461 from Severn Trent Laboratories, Inc. This report consists of the validation of 14 solid samples and one water sample collected on December 19, 2003, and analyzed on December 31, 2003 and January 5, 2004 for ICP metals; on January 7, 2004 for ICPMS (water sample only); and on December 30-31, 2003 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
01-VBOU3-SB-0001-A[+]	D3L190461-001
01-VBOU3-SB-0001-B	D3L190461-002
01-VBOU3-SB-0001-C	D3L190461-003
01-VBOU3-SB-0001-D	D3L190461-004
01-VBOU3-SB-0036-A[+]	D3L190461-005
01-VBOU3-SB-0036-B	D3L190461-006
01-VBOU3-SB-0036-C	D3L190461-007
01-VBOU3-SB-0026-A	D3L190461-008
01-VBOU3-SB-0026-B	D3L190461-009
01-VBOU3-SB-0026-C	D3L190461-010
01-VBOU3-SB-0012-A	D3L190461-011
01-VBOU3-SB-0012-B	D3L190461-012
01-VBOU3-SB-0013-A	D3L190461-013
01-VBOU3-SB-0013-B	D3L190461-014
01-VBOU3-RIN-0005	D3L190461-015

[+] denotes full validation

Validated By: Amy Ballow (signature) Reviewed By: Bill Fear (signature)

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Samples 01-VBOU3-SB-0001-A and 01-VBOU3-SB-0036-A were randomly selected for full validation. Cursory validation was conducted on all remaining samples. The data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation
* Calibrations
* Blanks
* Interference Check Samples
Matrix Spike/Matrix Spike Duplicates
* Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
Serial Dilution for ICP Analysis
Analyte Quantitation and Reporting Limits (full validation only)

* **All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficient for mercury was greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recovery of mercury was within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

The rinsate sample, 01-VBOU3-RIN-0005, reported detected results for aluminum at 110 ug/L, calcium at 280 ug/L, iron at 220 ug/L, and manganese at 12 ug/L. Qualification was not necessary because the sample results for these elements were above the blank action levels (greater than the RL and five times the rinsate blank value).

Interference Check Samples

All interference check sample percent recoveries were within acceptable limits.

The aluminum, calcium, iron, and magnesium concentrations in the full validation samples were less than the ICSA values and no action was required.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed sample 01-VBOU3-SB-0026-B and on samples from another SDG (D3L180365-001 and D3L180365-002) for ICP metals and mercury analyses.

The following detected sample results were qualified as estimated (J) because the spike recovery at 134% was greater than 125%:

- Vanadium in all solid samples (all samples except 01-VBOU3-RIN-0005)

The following sample results were qualified as estimated (J/UJ) because the spike recoveries were less than 75% but greater than 30%:

- Antimony (33%/35%) in all solid samples (all samples except 01-VBOU3-RIN-0005)

All other MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the un-spiked sample amount was greater than 4 times the spike value and the recoveries were no applicable.

The laboratory was evaluating the spike recoveries against the laboratory QC limits. As a result, the laboratory flagged the water recovery for aluminum at 122% as outside the laboratory QC limits of 83-119%. No action was taken as the recovery was within the validation limits of 75-125%. Additionally, antimony and vanadium were not flagged as being outside QC limits in the solid MS/MSD analyses because the recoveries were within the laboratory limits.

Post-digestion spike recoveries were not provided for vanadium and antimony. No action is taken based on post-digestion results.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected. Additionally, recoveries for detected results were calculated using actual results rather than the rounded results reported on the summary Form 5A.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated from the MS/MSD RPDs. All RPDS were within QC limits.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses for both matrices. All recoveries were within the laboratory QC limits for the solid analysis and within 80-120% for the water analysis. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on sample 01-VBOU3-SB-0026-B and on a water sample from another SDG.

The following detected sample results were qualified as estimated (J) because the serial dilution %D exceeded 10% for analyte concentrations greater than 50 times the MDLs:

- Manganese in all solid samples

The serial dilution result for manganese was not flagged by the laboratory. All other %Ds were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. No calculation or transcription errors were found. However, although the laboratory reported percent moisture values, the results were not adjusted for dry weight.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R	-	Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
J	-	The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
U J	-	The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.
U	-	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
NR	-	Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

BATCH: D3L190461

List all analytes which do not meet holding time criteria

	Sample ID	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	*CN Analysis Date	Analysis Date/s	No. of Days Past Holding Time	Action
* 01	01-VB043-SB-0001A	Solid	None	12-19-03	1-5-04/12-31	12-31-03			Ø	None
02	SB-0001-B									
03	SB-0001-C									
04	SB-0001-D									
* 05	SB-0036-A									
6	SB-0036-B									
7	SB-0036-C									
8	SB-0026-A									
9	SB-0026-B									
10	SB-0026-C									
11	SB-0012-A									
12	0012-B									
13	0013-A									
14	01-VB043-SB-0013-B									
15	01-VB043-RIN-0005 (Rinsate)	Rinsate	HNO_3 ✓		1-7-03	12-30-03				
	* Full Valid.									

COMMENTS Temp = 2.3 °C ✓

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: Amy Ballou Date: 02-09-04

Review By: [signature] Date:

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C

B. Cooled to 4°C

C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE	
		AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

*VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

BATCH: D3L190461

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
ICP	ICV			90-110%	None	All w/in criteria
	CCV's					

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No Non CLP

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: D3L190461

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
Hg ICV			80-120?	None	All w/in criteria
CCVS					

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.999 ✓
   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No Non-CLP
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	JJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).
2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

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TECHLAW

III. INORGANIC ANALYSIS WORKSHEET -- BLANKS

MATRIX: Soil / Water BATCH: D3L190461

List the highest positive AND negative blank result >=|IDL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
ICP Water	MB	- All ND				All U = No Action
Soil						
Hg Water	MB	- All ND				
Soil						
ICP Water	ICB	All ND				
Hg Soil	CCBs					
Rinsate						
-15 01-VBOUS-RIN-0005			µg/L ÷ 1/10 × 5 =	AL = mg/kg		
	Al	100	110 µg/L	55 mg/kg	None	>5* No Action
	Ca	200	280	140	↓	↓
	Fe	100	220	110	↓	↓
	Mn	10	12	6	↓	↓

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify

One prep blank per matrix

One prep blank per batch

ICB analyzed immediately after ICV

CCB analyzed after each CCV.

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D3L190461

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
-01 } Full only				Okay < ICSA ✓
-05				↓

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
			80-120% ✓ All ✓

CLP Protocol Only
Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

TECHLAW

IVB. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D3L190461

Note: For the CLP protocol only, report the concentration of any analytes detected in the ICSA solution > |IDL | that should not be present (apply only to samples with elements identified at concentrations above the ICSA on the previous page).

Analyte	ICSA Result	Action	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result
NA								
					NA			

Actions:

If the ICSA value > the positive IDL:

1. For non-detected results, no action is taken.
2. Estimate (J) all detected results < = 5*ICSA.

If the ICSA value < -IDL:

1. Estimate (J) detected results < = 5* |ICSA|.
2. Estimate (UJ) non-detected results.

TECHLAW

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: Soil / Water BATCH: D3L190461

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
Analo SDG	ICP				75-125%	None	w/in criteria
Hg-Water	Hg	Waters.			↓	↓	↓ RPD's ✓
ICP ↓					↓	↓	↓
461-09-							
Hg-Soil		Soil	✓		75-125%	None	w/in criteria RPD's ✓
461-009							
ICP	Ca MS	10500	7006	5050	69% ↓	~~J/45~~	-soils Not qualified RPD's ✓
	MSD	12300	↓	↓	109 ✓		For Soils
	Sb MS	50.5	ND	16.9	33 ↓	J/UJ	-soils
	MSD	↓	↓	17.6	35 ↓	↓	
	V MS	↓	35	89.2	108 ✓		
	MSD	↓	↓	102	134 ↑	J+	-Soils = All were + = All Soil = J
							Ca, Sb, V- Not Flagged by lab
Post-digest for Be,	Sb, As, Be	Cd, Th - only summary					as the %R w/within Lab limits
							Not all %R exactly repeatable
							okay

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS Water Fe = Sample result >4x spike - No Action // Soil Al, Fe, Mn results >4x Spike - No Action

Note: Al = MSD: 122% - outside lab limits but w/in Valid. 75-125% ✓
Water

No Post-digest recovery for Ca, Sb, + V = No Action

1. If any analyte does not meet the %R criteria, qualify all associated samples using the following criteria:

Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Calculation for errors for those w/ ND as sample result using [illegible] value

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: Soil/Water BATCH: D3L190461

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
							Use MS/MSD
							RPD ✓

COMMENTS

Actions:

1. AQUEOUS

If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.

If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID

If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.

If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|

Include outliers for field duplicates (if applicable)

Note

A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX: Soil /Water BATCH: D3L190461

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
LCS-Soil	LCS only			w/in limits	None	✓
ICP • Hg				Soil		
LCS/LCSD				80-125	None ✓	RPD's.
Water						
ICP • Hg						
						Okay ✓

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

	PERCENT RECOVERY			
1. AQUEOUS	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: Soil/Water BATCH: D3L190461

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
Shared QC - other							
Mn	0.54	27	5171.26	5696.93	10.2	J-All Solid	- Not Flagged -
-09 01-VB003-SB-0026-B							All Mn-Soil J → J

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following

COMMENTS As = 49.2 = <50 IDL ✓ IDL = 4.9 (x50 = 245)
Mn = 5171 ≥50 IDL ✓ IDL = 0.54 (x50 = 27)

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: D3L190461

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

Okay

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes No NA

10-31-03 / 10-6-03

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NA

8-1-03 / 9-6-03

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes No NA

4-2-03 / 8-22-03

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

COMMENTS Water ICP 50ml -> 50ml
Hg = 10ml -> 10ml

Soil ICP = 1.0g -> 100ml
Hg - 0.3g -> 50ml

DATA VALIDATION REPORT

To:	Jennifer Walter – Syracuse Research Corporation
From:	Ken Schroeder – TechLaw, Inc.
Report Date:	February 17, 2004
Project/Site:	VB I-70 OU3
Laboratory No.:	D3L190464

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B and 7471A for Laboratory Lot No. D3L190464 from Severn Trent Laboratories, Inc. This report consists of the validation of 20 solid samples collected on December 18 and 19, 2003 and analyzed on January 1-5, 2004 for ICP metals and on December 31, 2003 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
01-VBOU3-SB-0033-A	D3L190464-001
01-VBOU3-SB-0033-B	D3L190464-002
01-VBOU3-SB-0033-C	D3L190464-003
01-VBOU3-SB-0033-D +	D3L190464-004
01-VBOU3-SB-0033-E	D3L190464-005
01-VBOU3-SB-0037-A	D3L190464-006
01-VBOU3-SB-0037-B	D3L190464-007
01-VBOU3-SB-0037-C	D3L190464-008
01-VBOU3-SB-0035-A	D3L190464-009
01-VBOU3-SB-0035-B	D3L190464-010
01-VBOU3-SB-0035-C +	D3L190464-011
01-VBOU3-SB-0024-A	D3L190464-012
01-VBOU3-SB-0024-B	D3L190464-013
01-VBOU3-SB-0024-C	D3L190464-014
01-VBOU3-SB-0024-D	D3L190464-015
01-VBOU3-SB-0025-A	D3L190464-016
01-VBOU3-SB-0025-B	D3L190464-017
01-VBOU3-SB-0023-A	D3L190464-018
01-VBOU3-SB-0023-B	D3L190464-019
01-VBOU3-SB-0023-C	D3L190464-020

+ denotes full validation

Validated By: Ken Schroeder
Ken Schroeder

Reviewed By: Amy Ballow
Amy Ballow

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Samples 01-VBOU3-SB-0033-D and 01-VBOU3-SB-0035-C were randomly selected for full validation. Cursory validation was conducted on all remaining samples. The data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation
* Calibrations
Blanks
* Interference Check Samples
Matrix Spike/Matrix Spike Duplicates
* Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
Serial Dilution for ICP Analysis
* Analyte Quantitation and Reporting Limits (full validation only)

* **All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficient for mercury was greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

The following sample results were qualified as non-detected (U) because of contamination found in the calibration blanks bracketing the sample analyses. The sample results were less than five times the blank result.

- Lead and potassium in sample 01-VBOU3-SB-0033-D

No action was required for additional blank contamination because the sample results were above the blank action levels.

No field blanks were provided in this SDG.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

The aluminum, calcium, iron, and magnesium concentrations in the full validation samples were less than the ICSA values and no action was required.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on sample 01-VBOU3-SB-0023-A for ICP metals and mercury analyses.

The following detected sample results were qualified as estimated (J) because the spike recoveries were greater than 125%:

- Vanadium (127%) in all samples

The following sample results were qualified as estimated (J/UJ) because the spike recoveries were less than 75%, but greater than 30%:

- Antimony (38%/39%) and zinc (41%) in all samples

All other MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the unspiked sample amount was greater than four times the spike value and the recoveries were not applicable.

The laboratory evaluated the spike recoveries against the laboratory QC limits. As a result, vanadium and antimony were not flagged as being outside QC limits in the MS/MSD analyses of sample 01-VBOU3-SB-0023-A because the recoveries were within the laboratory QC limits.

Post-digestion spike recoveries were not provided for vanadium, antimony, or zinc. No action is taken based on post-digestion results.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected. Additionally, recoveries for detected results were calculated using actual results rather than the rounded results reported on the summary Form 5A.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD RPDs. All duplicate criteria were met. No calculation errors or transcription errors were found.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses and all recoveries were within the laboratory QC limits for the solid analysis.. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on sample 01-VBOU3-SB-0023-A.

The following detected sample results were qualified as estimated (J) because the serial dilution %D exceeded 10% for analyte concentrations greater than 50 times the MDLs:

- Chromium and vanadium in all samples
- Sodium in samples 01-VBOU3-SB-0033-A, 01-VBOU3-SB-0033-E, 01-VBOU3-SB-0037-B, 01-VBOU3-SB-0037-C, 01-VBOU3-SB-0024-A, 01-VBOU3-SB-0024-B, 01-VBOU3-SB-0024-D, 01-VBOU3-SB-0025-A, 01-VBOU3-SB-0025-B, 01-VBOU3-SB-0023-A, 01-VBOU3-SB-0023-B, and 01-VBOU3-SB-0023-C

All other %Ds in the serial dilution analysis were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. No calculation or transcription errors were found. However, although the laboratory reported percent moisture values, the results were not adjusted for dry weight.

According to the project narrative, due to matrix interferences, the reporting limits for cadmium in five samples were raised.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

U J - The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

NR - Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

BATCH: D3L190464

List all analytes which do not meet holding time criteria 6010B 747/A

Lab ID	Sample ID	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	*CN Analysis Date	Analysis Date/s	No. of Days Past Holding Time	Action
001	01-VB043-SB-0033-A	Soil	B	12/18/03	1/4-5/04	12/31/03			0	NONE
002	-B									
003	-C									
004	-D									
005	-E									
006	0037-A									
007	-B									
008	-C									
009	0035-A									
010	-B									
011	-C									
012	0024-A			12/19/03						
013	-B									
014	-C									
015	-D									
016	0025-A									
017	-B									
018	0023-A				1/1-5/04					
019	-B									
020	-C									

COMMENTS Temp = 2°C / No 6020 analysis performed.

Full validation on 004 & 011. /

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: Ken Schroeder Date: 2/12/04

Review By: Amy Barlow Date: 2-17-04

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	26 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

*VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

BATCH: D3L190464

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
					None	All within 90 - 110 %

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No NA

COMMENTS

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: D3L190464

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
				None	All criteria met. ✓

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.99983

   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).
2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

III. INORGANIC ANALYSIS WORKSHEET – BLANKS

MATRIX: Soil

BATCH: D3L190464

List the highest positive AND negative blank result >=|DL| below. Use one worksheet for soil matrix and another for water matrix.

	Analyte	ICB CCB PB/MB	RL ~~IDL~~ mg/L	Blank Conc. mg/L	5 * Bl. Conc. mg/L	mg/Kg	Action	Samples Affected
1/1/04	Pb	CCB16	0.003	0.00393	0.0197	1.97	None	(Assoc. samples >5X)
1/4/04	Pb	CCB15	↓	0.00351	0.0176	1.76	U	004
1/5/04	K	CCB17	1.00	1.3588	6.794	679	U	004

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify trace ICP (1/1/04) \ CCB16 \ 018, 019, 020 \ CCB17 \

One prep blank per matrix

One prep blank per batch trace ICP (1/4/04) \ CCB15 \ 001-008 \ CCB16 \ 009-017 \ CCB17 \

ICB analyzed immediately after ICV ✓ ICP (1/5/04) \ CCB17 \ 001-008 \ CCB18 \ 009-017 \ CCB19 \ 018-020 \ CCB20 |

CCB analyzed after each CCV. ✓

COMMENTS All blanks reported to RL.
All prep blanks < RL.

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D3L190464

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
				All < ICSA values
				for full validation
				samples.

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
		None	All within 80-120 %

CLP Protocol Only
Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS Full validation samples = 004 & 011.

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

IVB. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D3L190464

Note: For the CLP protocol only, report the concentration of any analytes detected in the ICSA solution > |IDL | that should not be present (apply only to samples with elements identified at concentrations above the ICSA on the previous page).

Analyte	ICSA Result	Action	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result
N/A								

Actions:

If the ICSA value > the positive IDL:
1. For non-detected results, no action is taken.
2. Estimate (J) all detected results < = 5*ICSA.

If the ICSA value < -IDL:
1. Estimate (J) detected results < = 5* |ICSA|.
2. Estimate (UJ) non-detected results.

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: Soil BATCH: D3L190464

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added mg/Kg	% R	Action	Samples Affected
018 MS	Sb	19.2	ND	50.0	38.4	J/UJ	ALL
MSD	↓	19.5	↓	↓	39.0		
MS	V	94.1	30	50.0	128	J +	ALL (all are detects)
MSD	Zn	114	93	50.0	42	J/UJ	ALL (" " ")
							Note. Lab QC limits are not 75-125%. Sb and V were not flagged.

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS Sample > 4X spike for Al, Fe, Mn

018 also used for mercury QC.

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: Soil BATCH: D3L190464

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
						None	All RPDS <35%.

COMMENTS Use MS/MSD in place of duplicates

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

[3]Difference = |Sample result - Duplicate sample result|

Note
A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX: Soil BATCH: D3L190464

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
					None	All within 80–120%
						(all within soil LCS
						limits)

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

	PERCENT RECOVERY			
1. AQUEOUS	<50%	50-79%	80-120% ✓	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS ✓	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V.

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: Soil BATCH: D3L190464

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
Cr	2.1 ug/L	105 ug/L	129.06	143.16	10.9	J ⊕	ALL
V	2.6 ug/L	130 ug/L	303.60	335.24	10.4	J ⊕	ALL
Na	100 ug/L	5000 ug/L	5207.05	4487.8	13.8	J ⊕	001, 005, 007, 008, 012, 013, 015, 016, 017, 018, 019, 020

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS Serial dil. result for Na obtained from raw data. Result reported on Form 9 is 5000U.

See MS page for QC sample ID.

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. METAL ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: D3L190464

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

① Form 13 reports all sample wts as "1.00" rather than actual weights reported on prep. log. For Hg, Form 13 shows "0.30".

② PQLs of Form 10 do not match RLs on Form 1 for the following:
Cu, Pb, Se, Tl, V, Mg, Na, K

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes **No** NA

>3 months old for one ICP.

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? **Yes** No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes **No** NA

>3 months old.

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No **NA**

7. Were all sample results reported down to MDL if running SW-846 methods? Yes **No** NA

Reported to RL

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? **Yes** No

COMMENTS Full validation samples:

004 - Results match raw data. (Results calculated correctly)
011 - " " " " " " "

Due to interferences, the RL for cadmium was raised for five samples.

No errors noticed on Form 14.

DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Bill Fear – TechLaw, Inc.
Report Date: March 12, 2004
Project/Site: VB I-70 OU3
Laboratory No.: R8-040018

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 200.7, 200.8, and 7470A for Laboratory Lot No. R8-040018 from the USEPA Region 8 Technical & Management Services Laboratory Service Program. This report consists of the validation of three total and two dissolved water samples collected on December 12 and 18, 2003, and analyzed on January 5 and 6, 2004 for ICP metals; on January 7, 2004 for ICPMS; and on January 7, 2004 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Tag Number	Laboratory Sample Number
01-VBOU3-GW-0002	8-211149	03-E002562
01-VBOU3-GW-0003	8-211136	03-E002563
01-VBOU3-GW-0005	8-246851	03-E002564
01-VBOU3-GW-0001	8-246852	03-E002560
01-VBOU3-GW-0004	8-246511	03-E002561

The laboratory used the EPA Tag Number rather than the Sample Identification Number to identify these samples. The station numbers (the last four numbers of the sample number) are also included on the results summary forms.

Validated By: Kim Schuddy for Bill Fear
Bill Fear

Reviewed By: L. Tyson
Lisa Tyson

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Full validation was conducted on all samples. The data were evaluated based on the following parameters:

Data Completeness
* Holding Times and Preservation
* Calibrations
Blanks
* Interference Check Samples
Matrix Spike/Matrix Spike Duplicates
Duplicate Samples
Blank Spikes (Laboratory Control Samples)
* Serial Dilution for ICP Analysis
* Analyte Quantitation and Reporting Limits (full validation only)

*** All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided. The raw data were originally not included, but were provided upon request for resubmittal.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

Although no shipping or receiving problems were noted, sample preservation and receipt temperatures were not documented. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficient for mercury was greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency.

The following sample results were qualified as non-detected (U) because of contamination found in the calibration blanks bracketing the sample analyses. The sample results were less than five times the blank result.

- Calcium, nickel, and manganese in sample 01-VBOU3-GW-0005
- Mercury in sample 01-VBOU3-GW-0003

The following detected sample results were qualified as estimated (J) because of negative blank contamination found in the preparation blank analysis. The sample result was less than five times absolute value of the blank.

- Sodium in sample 01-VBOU3-GW-0005

No action was required for additional blank contamination because the sample results were above the blank action levels.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

The iron concentration in sample 01-VBOU3-GW-0002 was greater than the ICSA value. However, no action was required because all sample results were well above any interference levels.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on various samples for ICP metals and mercury analyses. No calculation errors or transcription errors were found.

The following detected sample results were qualified as estimated (J) because the associated spike recoveries in the MS/MSD of sample 01-VBOU3-GW-0003 were greater than 125%:

- Arsenic (144.7%/143.8%), lead (159.4%/161.7%), selenium (145.5%/143.9%), silver (139.6%/137.7%), and thallium (141.3%/141.4%) in samples 01-VBOU3-GW-0002, 01-VBOU3-GW-0003, and 01-VBOU3-GW-0005
- Beryllium (136.7%/140.9%) in samples VBOU3-GW-0002 and 01-VBOU3-GW-0005
- Vanadium (141.4%/144.6%) samples 01-VBOU3-GW-0002 and 01-VBOU3-GW-0003

The laboratory prepared a new pre-digestion spike on sample 01-VBOU3-GW-0005 and all recoveries were within 75-125%. However, all sample analyses were reported from the initial preparation batch associated with the MS/MSD not meeting QC limits. The post digestion spike for sample 01-VBOU3-GW-0003 was within QC limits, however, results of the post digestion spike do not affect sample qualification.

All other MS/MSD percent recoveries were within technical validation QC limits of 75-125% or the unspiked sample amount was greater than 4 times the spike value and the recoveries were no applicable.

Potassium was flagged as not meeting the laboratory QC limits of 80-120% in the matrix spike of sample 01-VBOU3-GW-0003. No action is required because the recovery at 121% was within validation limits of 75-125%.

Duplicate Sample Analysis

Duplicate sample analyses were performed on samples 01-VBOU3-GW-0003 and 01-VBOU3-GW-0001. No calculation errors or transcription errors were found.

The following sample results were qualified as estimated (J) because the duplicate RPD exceeded 20% in the duplicate analyses of sample 01-VBOU3-GW-0003:

- Cadmium (23.4%) and lead (22.2%) in samples 01-VBOU3-GW-0002, 01-VBOU3-GW-0003, and 01-VBOU3-GW-0005

Laboratory Control Samples

The laboratory performed a laboratory control sample analysis for the total metals. All recoveries were within the laboratory QC limits of 80-120% except for beryllium. No calculation errors or transcription errors were found.

The following sample results were qualified as estimated (J/UJ) because the associated LCS recovery was less than 80%:

- Beryllium (78.7%) in samples 01-VBOU3-GW-0002, 01-VBOU3-GW-0003, and 01-VBOU3-GW-0005

The beryllium recovery may have been affected by the elevated recovery for the internal standard lithium observed in the LCS analysis.

Serial Dilution Analysis

The laboratory performed the serial dilution analyses on samples 01-VBOU3-GW-0003 and 01-VBOU3-GW-0001. All percent differences (%Ds) were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated. Various sample analyses were analyzed at dilutions of 2x or 4x. No calculation or transcription errors were found.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

UJ - The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

NR - Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

01-VB043

BATCH: RS-040018

List all analytes which do not meet holding time criteria ICP ICPMS

	Sample ID	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	~~*CN~~ Analysis Date	Analysis Date/s	No. of Days Past Holding Time	Action
T	GW-0002	A20		12/12/03	1/6/04	1/7/04	1/7/04		-0-	
T	GW-0003			12/16/03						
T	GW-0005									
D	GW-0004	A20		12/16/03	1/5/04	1/7/04	1/7/04			
D	GW-0001			12/12/03						
								Dil Hg Date on		
	Icy unit									
	Tag #s	Station #								
	S-211149	GW-02								
	S-211136	0003								
	S-246851	0005								
	S-246854	-0004								
	S-246852	GW-01								

COMMENTS Hg dil 25 & 26 for 0002

Cd, As, Be, Cd, Pb, Se, Ag, Tl, V - ICPMS

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: [signature] Date:

Review By: [signature] Date:

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

***VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.**

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

BATCH: R8-040018

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
						1-4 ICPMS ✓
						1-6 ICP ✓
					None	

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY <75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: 28-04 0018

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
				—	none out
				None	

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.9990

   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

III. INORGANIC ANALYSIS WORKSHEET -- BLANKS

MATRIX: H2O BATCH: RS-04008

List the highest positive AND negative blank result >=|DL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
112 ICP	5	ok	ND @ RL			
Ca	CCB4		582 ug/L	2935	U	0005 Sample
Co	"		-1.9	—	>5x	Result 90 ug/L
						0.09 mg/L
Mg	CCB3		150.1	750.5	—	7. Sample in mg/L
Mn	PB		11.15	56		
	CCB4		21.68	108.7	U	0005
K	CCB2		2.58	12.1		
	CCB4		5.35	26.7	U	0005
Na	PB		-130.2	651	~~UJ~~	0005 Sample in mg/L
Zn			5.12		—	>5x
				x5+x2		
Hg	CCB2		0.034	0.34	U	0003 Single 2x
	CCB3		0.033	0.33		
					ug/L	
Na	CCB2	ug/L→	458.5	2294.5	—	both 01, 002 > 5x
Zn	CCB1		2.10	10.8	—	(Sample Results in
						mg/L
						for sodium)
						577 mg/L
						76 "

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify

One prep blank per matrix ND prep for dissolved

One prep blank per batch

ICB analyzed immediately after ICV

CCB analyzed after each CCV.

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).
* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

total

All

TECHLAW

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: R8-04001 8

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
~~GW-02~~				GW0004-08 @ (2X)
GW-02	Fe	226	250	

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
			ICP-ws - GW-20

CLP Protocol Only

Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS @ beginning

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

IVB. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

ug/L

BATCH: RS-044004

Note: For the CLP protocol only, report the concentration of any analytes detected in the ICSA solution > |IDL | that should not be present (apply only to samples with elements identified at concentrations above the ICSA on the previous page).

Analyte	ICSA Result	Action	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result
CR	-2	none						
	(RL=1.0)							
Mn	13.81	none						
Zn	5.01	—						

Actions:

All Sample Results ↑

If the ICSA value > the positive IDL:
1. For non-detected results, no action is taken.
2. Estimate (J) all detected results < = 5*ICSA.

If the ICSA value < -IDL:
1. Estimate (J) detected results < = 5* |ICSA|.
2. Estimate (UJ) non-detected results.

Sample Name: 03-2562 Acquired: 01/06/2004 10:13:00 Type: Unk
Method: IntStd4 Mode: CONC Corr. Factor: 1.000000
User: admin Custom ID1: Custom ID2: Custom ID3:
Comment: 8-2ℓ1149 @4x
1

Elem	Ag3280	Al3961	As1890	As1937	Ba4554	Ba4934
Line	328.068 {102}	396.152 { 85}	189.042 {177}	193.759 {173}	455.403 { 74}	493.409 { 68}
IS Ref	(Y_3710)	(Y_3710)	(Y_2243)	(Y_2243)	(Sc4246)	(Sc4246)
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**.04594**	**88.63**	**2.8194**	**2.8806**	**.3518**	**.3459**
Stddev	.00058	1.28	.0390	.0364	.0063	.0026
%RSD	1.2698	1.448	1.3828	1.2628	1.796	.7572
#1	.04527	88.36	2.7764	2.8787	.3452	.3434
#2	.04623	90.03	2.8525	2.8453	.3523	.3458
#3	.04632	87.50	2.8292	2.9179	.3578	.3486
Check ?	None	None	None	None	None	None
Value						
Range						

Elem	Be3130	Ca3158	Ca3179	Cd2144	Co2286	Cr2677
Line	313.042 {107}	315.887 {106}	317.933 {105}	214.438 {156}	228.616 {147}	267.716 {126}
IS Ref	(Sc4246)	(Sc4246)	(Sc4246)	(Y_2243)	(Y_2243)	(Y_2243)
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**.0053**	**184.0**	**184.2**	**1.658**	**.0497**	**.1149**
Stddev	.0001	.9	1.0	.011	.0006	.0029
%RSD	2.376	.4793	.5666	.6484	1.203	2.495
#1	.0051	183.4	183.0	1.646	.0492	.1123
#2	.0054	185.0	184.9	1.664	.0504	.1180
#3	.0053	183.7	184.7	1.664	.0496	.1145
Check ?	None	None	None	None	None	None
Value						
Range						

0.002

>250

Elem	Cu3247	Fe2382	Fe2599	K_7664	Mg2790	Mn2605
Line	324.754 {103}	238.204 {141}	259.940 {129}	766.490 { 44}	279.079 {120}	260.569 {129}
IS Ref	(Y_3710)	(Sc2552)	(Sc2552)	(Sc4246)	(Sc2552)	(Sc2552)
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**9.3738**	**280.4**	**275.7**	**23.06**	**37.08**	**5.6982**
Stddev	.0677	2.5	2.3	.54	.40	.0500
%RSD	.72170	.8740	.8380	2.358	1.077	.87679
#1	9.3234	278.6	273.0	22.49	36.70	5.6466
#2	9.3474	279.3	276.9	23.10	37.04	5.7019
#3	9.4507	283.1	277.1	23.58	37.50	5.7463
Check ?	None	None	None	None	None	None
Value						
Range						

000228

Sample Name: 03-2562 Acquired: 01/06/2004 10:13:00 Type: Unk
Method: IntStd4 Mode: CONC Corr. Factor: 1.000000
User: admin Custom ID1: Custom ID2: Custom ID3:
Comment: 8-241149 @4x

Elem	Mo2020	Na5889	Ni2216	Pb2203	Sb2068	Se1960
Line	202.030 {166}	588.995 { 57}	221.647 {152}	220.353 {152}	206.833 {162}	196.090 {171}
IS Ref	(Y_2243)	(Sc4246)	(Y_2243)	(Y_2243)	(Y_2243)	(Y_2243)
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avg	**.00915**	**208.2**	**.22237**	**4.6103**	**-.1810**	**.00148**
Stddev	.00061	3.5	.00054	.0359	.0069	.00289
%RSD	6.6380	1.668	.24138	.77867	3.799	195.52
#1	.00885	204.6	.22179	4.5719	-.1736	.00433
#2	.00985	208.5	.22284	4.6161	-.1872	-.00145
#3	.00876	211.5	.22248	4.6430	-.1823	.00156
Check ?	None	None	None	None	None	None
Value						
Range						

Elem	Si2516	Tl1908	V_2924	Zn2062
Line	251.612 {134}	190.864 {175}	292.402 {115}	206.200 {163}
IS Ref	(Y_2243)	(Y_2243)	(Y_3710)	(Y_2243)
Units	ppm	ppm	ppm	ppm
Avg	**49.20**	**-.0106**	**.0487**	**21.302**
Stddev	1.31	.0008	.0021	.405
%RSD	2.657	7.849	4.375	1.9006
#1	47.72	-.0115	.0469	20.909
#2	50.21	-.0100	.0511	21.718
#3	49.66	-.0102	.0482	21.278
Check ?	None	None	None	None
Value				
Range				

Int. Std.	Sc2552	Sc4246	Y_2243	Y_3710
Line	255.237 {132}	424.683 { 79}	224.306 {150}	371.030 { 90}
Units	Cts/S	Cts/S	Cts/S	Cts/S
Avg	**5.0667**	**62.662**	**44.703**	**604.43**
Stddev	.0404	1.080	.254	.27
%RSD	.79806	1.7229	.56780	.04417
#1	5.1067	63.579	44.415	604.34
#2	5.0678	62.936	44.800	604.23
#3	5.0258	61.473	44.894	604.74

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: H2O BATCH: L8-04008

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
0003	As	157	12.2	100	144.7	J	MS Dup 144
	Be	68.3	—	50	136.7		141
	Pb	202	42.6	100	159.4		162
	Se	83.8	11.05	50	145.5		144
	Ag	71.98	2.14	50	139.6		138
	Tl	75.35	4.08	10	141.2		141
	V	330	41.7	200	144.7		145
0003	K				121.6	→	w/in 75-125%
							flagged if 1st batch for ICP
01	ICPMS	✓					
	ICP ✓						

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA ok

3. Was a matrix spike prepared for each different sample matrix? Yes No ~~0003 ICP~~ ok

COMMENTS C234x but does not change qual.

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

note ICPMS was redigested for spike/dup all ok but none of samples were reported for the redigest. 0005 redigest. qualify using 0003 MS/MSD above. 003 also rerun on 2/2 - ok but samples all from MS/MSD 1st prep/run.

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VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: H_2O BATCH: R8-04008

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
03	Cd	908	1149	23.4	–	J	
	Pb	426	532	22.2		J	
	Tl	4.65	2.91		<2	–	
01	ICP-MS	✓					
	ICP	✓					

COMMENTS

241 / 1029 >23.4

Actions:

1. AQUEOUS

If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.

If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID

If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.

If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|

Include outliers for field duplicates (if applicable)

Note

A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

TECHLAW

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX: H2O BATCH: RS-04048

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
ICPMS	Be	~~757~~	787.37	75%	J/UJ	
		1000				
	Tl	500	3986.4	60%	—	equal to 76-7
						round to 80%
IC0116	—	—	—	—	—	for 120

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS No LCS for 1/7 ICPMS Rerun 1/21/04

LCS totals only ~~pres~~

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

	PERCENT RECOVERY			
1. AQUEOUS	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

TECHLAW

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: H2O BATCH: R3-04418

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
3 ICP-MS							ok
3 ICP							ok
01 ICP-MS							

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: R8-04008

1. Describe any raw data anomalies (i.e.. baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

None.

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

Samples @ dilutions 2x or 4x

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes No NA

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes No NA

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

COMMENTS Hg [illegible]-02 8.851 x 2= 17.8 @ 17.7

C2 0004 887 x2 = 1774 @ 1770

Diff. Between EDD + Raw Data Pack.

~~Data Pack~~

(1) EDD has B quals for results between the MDL + PQL, however, Form 1 does not.

(2) All results on EDD in ug/L but Form 1 has CA, K, Mg + Na in mg/L

(4) Slight rounding + sig fig. difference ~~to~~ ~~Sb~~

i.e. Cu 005 6.43 vs. 6.4

~~Al ... ug/l vs.~~

005 Zinc ~~129.8~~ 130 vs. 129.8

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
TECHNICAL & MANAGEMENT SERVICES

LABORATORY SERVICES PROGRAM — CERTIFICATE OF ANALYSIS

SAMPLE NUMBER: 8-211149
MATRIX: WATER
PROJECT: ARGO SMELTER 04-18
TEST: TR-METALS
ANALYST: (ICP) SBW S.W. (AACV) JE (ICPMS) SBW
LAB NUMBER: 03-E002562

DATE-TIME SAMPLED: 12/12/03 14:15
STATION ID: GW-02
ULSA NUMBER: 04-18
ANALYSIS COMPLETE DATE: see below

REMARKS: ICP-OE and ICP-MS analysis required a 4x dilution. Mercury analyzed at a 2x dilution. Detection limits raised.

METHOD	PARAMETER	RESULT	COMP DATE
	AACV GROUP	AACV MERCURY	1/ 7/04
7470	Mercury	17.7	
	ICP_MS GROUP	ICPMS RESULTS	1/ 7/04
200.8	Antimony	40.1	
200.8	Arsenic	11600 J	
200.8	Beryllium	26.1	
200.8	Cadmium	7400	
200.8	Lead	15800	
200.8	SELENIUM	39.4	
200.8	Silver	219.	
200.8	Thallium	300.	
200.8	Vanadium	541.0	
	ICP GROUP	ICP RESULTS	1/ 6/04
200.7	ALUMINUM	354500	
200.7	BARIUM	1410	
200.7	CALCIUM *	736.80	
200.7	CHROMIUM	459.6	
200.7	COBALT	199.	
200.7	COPPER	37495.	
200.7	IRON	1102800	
200.7	MAGNESIUM *	148.3	
200.7	MANGANESE	22792.8	
200.7	NICKEL	889.5	
200.7	POTASSIUM *	92.2	
200.7	SODIUM *	832.8	
200.7	ZINC	85208.	

NOTE: Analyte Results are in ug/L except * are in mg/L
Hardness Results are in mg Equivalent CaCO3/L

Of 3/11/04

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
TECHNICAL & MANAGEMENT SERVICES

LABORATORY SERVICES PROGRAM   CERTIFICATE OF ANALYSIS

SAMPLE NUMBER: 8-211136   DATE-TIME SAMPLED: 12/18/03 13:10
MATRIX: WATER   STATION ID: 0003
PROJECT: ARGO SMELTER 04-18   ULSA NUMBER: 04-18
TEST: TR-METALS   ANALYSIS COMPLETE DATE: see below
ANALYST: (ICP) SBW S.W.   (AACV) SE   (ICPMS) SBW
LAB NUMBER: 03-E002563

REMARKS: ICP-OE and ICP-MS analysis required a 4x dilution. Mercury analyzed at a 2x dilution. Detection limits raised.

METHOD	PARAMETER	RESULT	COMP DATE
	AACV GROUP	AACV MERCURY	1/ 7/04
7470	Mercury	0.10 U	
	ICP_MS GROUP	ICPMS RESULTS	1/ 7/04
200.8	Antimony	< 4	
200.8	Arsenic	12.2 J	
200.8	Beryllium	< 2 UJ	
200.8	Cadmium	908. J	
200.8	Lead	42.6	
200.8	SELENIUM	11.0	
200.8	Silver	2.19	
200.8	Thallium	4.68	
200.8	Vanadium	47.4	
	ICP GROUP	ICP RESULTS	1/ 6/04
200.7	ALUMINUM	27150	
200.7	BARIUM	414.	
200.7	CALCIUM *	360.12	
200.7	CHROMIUM	< 4	
200.7	COBALT	31.6	
200.7	COPPER	153.3	
200.7	IRON	25676.	
200.7	MAGNESIUM *	53.04	
200.7	MANGANESE	5691.2	
200.7	NICKEL	56.2	
200.7	POTASSIUM *	11.2	
200.7	SODIUM *	899.6	
200.7	ZINC	11170.	

NOTE: Analyte Results are in ug/L except * are in mg/L
Hardness Results are in mg Equivalent CaCO3/L

RF 3/11/04

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
TECHNICAL & MANAGEMENT SERVICES

LABORATORY SERVICES PROGRAM — CERTIFICATE OF ANALYSIS

SAMPLE NUMBER: 8-246851
MATRIX: WATER
PROJECT: ARGO SMELTER 04-18
TEST: TR-METALS
ANALYST: (ICP) SBW S.W. (AACV) SE (ICPMS) SBW
LAB NUMBER: 03-E002564

DATE-TIME SAMPLED: 12/18/03 13:15
STATION ID: 0005
ULSA NUMBER: 04-18
ANALYSIS COMPLETE DATE: see below

REMARKS: Mercury analyzed at a 2x dilution. Detection limit raised.

METHOD	PARAMETER	RESULT		COMP DATE
	AACV GROUP	AACV MERCURY		1/ 7/04
7470	Mercury	< 0.06		
	ICP_MS GROUP	ICPMS RESULTS		1/ 7/04
200.8	Antimony	138.		
200.8	Arsenic	41.4	J	
200.8	Beryllium	22.1		
200.8	Cadmium	24.8		
200.8	Lead	19.1		
200.8	SELENIUM	83.4		
200.8	Silver	35.2		
200.8	Thallium	30.0		
200.8	Vanadium	< 3		
	ICP GROUP	ICP RESULTS		1/ 6/04
200.7	ALUMINUM	< 10		
200.7	BARIUM	637.		
200.7	CALCIUM *	0.09	U	
200.7	CHROMIUM	< 1		
200.7	COBALT	183.		
200.7	COPPER	6.4		
200.7	IRON	283.		
200.7	MAGNESIUM *	13.55		
200.7	MANGANESE	89.4	U	
200.7	NICKEL	6.3	U	
200.7	POTASSIUM *	17.6		
200.7	SODIUM *	0.1	J	
200.7	ZINC	129.8		

NOTE: Analyte Results are in ug/L except * are in mg/L
Hardness Results are in mg Equivalent CaCO3/L

RF 3/11/04

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
TECHNICAL & MANAGEMENT SERVICES

LABORATORY SERVICES PROGRAM — CERTIFICATE OF ANALYSIS

SAMPLE NUMBER: 8-246852
MATRIX: WATER
PROJECT: ARGO SMELTER 04-18
TEST: D-METALS
ANALYST: (ICP) SBW S.W. (AACV) SE (ICPMS) SBW
LAB NUMBER: 03-E002560

DATE-TIME SAMPLED: 12/12/03 14:15
STATION ID: GW-01
ULSA NUMBER: 04-18
ANALYSIS COMPLETE DATE: see below

REMARKS: ICP-OE and ICP-MS analysis required a 2x dilution. Mercury analyzed at a 2x dilution. Detection limits raised.

METHOD	PARAMETER	RESULT	COMP DATE
	AACV GROUP	AACV MERCURY	1/ 7/04
7470	Mercury	< 0.06	
	ICP_MS GROUP	ICPMS RESULTS	1/ 7/04
200.8	Antimony	2.46	
200.8	Arsenic	32.8	
200.8	Beryllium	< 1	
200.8	Cadmium	8.73	
200.8	Lead	2.30	
200.8	SELENIUM	10.6	
200.8	Silver	< 0.4	
200.8	Thallium	0.62	
200.8	Vanadium	12.5	
	ICP GROUP	ICP RESULTS	1/ 5/04
200.7	ALUMINUM	108.	
200.7	BARIUM	25.0	
200.7	CALCIUM *	382.00	
200.7	CHROMIUM	< 2	
200.7	COBALT	13.6	
200.7	COPPER	< 8	
200.7	IRON	25820.	
200.7	MAGNESIUM *	60.90	
200.7	MANGANESE	8187.6	
200.7	NICKEL	36.6	
200.7	POTASSIUM *	14.4	
200.7	SODIUM *	764.0	
200.7	ZINC	1239.5	
SM 2340B	Hardness	1200	

NOTE: Analyte Results are in ug/L except * are in mg/L
Hardness Results are in mg Equivalent CaCO3/L

TK 3/11/09

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
TECHNICAL & MANAGEMENT SERVICES

LABORATORY SERVICES PROGRAM — CERTIFICATE OF ANALYSIS

SAMPLE NUMBER: 8-246511
MATRIX: WATER
PROJECT: ARGO SMELTER 04-18
TEST: D-METALS
ANALYST: (ICP) SBW SW. (AACV) SE (ICPMS) SBW
LAB NUMBER: 03-E002561

DATE-TIME SAMPLED: 12/18/03 13:10
STATION ID: 0004
ULSA NUMBER: 04-18
ANALYSIS COMPLETE DATE: see below

REMARKS: ICP-OE and ICP-MS analysis required a 2x dilution. Mercury analyzed at a 2x dilution. Detection limits raised.

METHOD	PARAMETER	RESULT	COMP DATE
	AACV GROUP	AACV MERCURY	1/ 7/04
7470	Mercury	< 0.06	
	ICP_MS GROUP	ICPMS RESULTS	1/ 7/04
200.8	Antimony	< 2	
200.8	Arsenic	3.2	
200.8	Beryllium	< 1	
200.8	Cadmium	1770	
200.8	Lead	1.35	
200.8	SELENIUM	7.1	
200.8	Silver	< 0.4	
200.8	Thallium	2.03	
200.8	Vanadium	12.1	
	ICP GROUP	ICP RESULTS	1/ 5/04
200.7	ALUMINUM	63.	
200.7	BARIUM	36.4	
200.7	CALCIUM *	375.60	
200.7	CHROMIUM	< 2	
200.7	COBALT	35.8	
200.7	COPPER	30.6	
200.7	IRON	261.	
200.7	MAGNESIUM *	48.28	
200.7	MANGANESE	5421.4	
200.7	NICKEL	30.3	
200.7	POTASSIUM *	9.9	
200.7	SODIUM *	877.0	
200.7	ZINC	10322.	
SM 2340B	Hardness	1140	

NOTE: Analyte Results are in ug/L except * are in mg/L
Hardness Results are in mg Equivalent $CaCO_3$/L

TB 3/11/04

ROUND 2: GROUNDWATER VALIDATION REPORTS

SDG: *D4E040112*
SDG: *D4E260121*
SDG: *D4G010356*
SDG: *D4G280388*

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DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Bill Fear – TechLaw, Inc.
Report Date: September 8, 2004
Project/Site: VB/I-70 OU3
Laboratory No.: D4G010356

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, and 7470A for Laboratory Lot No. D4G010356 from Severn Trent Laboratories, Inc. This report consists of the validation of five total and four dissolved water samples collected on July 1, 2004 and analyzed on July 13 and 22, 2004 for ICP metals; July 12, 2004 for ICPMS; and on July 14, 2004 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
MW-33-070104 (total)	D4G010356-001
MW-33-070104 (dissolved)	D4G010356-001
MW-34-070104 (total)	D4G010356-002
MW-34-070104 (dissolved)	D4G010356-002
MW-31-070104 (total)	D4G010356-003
MW-32-070104 (total) +	D4G010356-004
MW-32-070104 (dissolved) +	D4G010356-004
MW-30-070104 (total)	D4G010356-005
MW-36-070104 (dissolved)	D4G010356-006

+ denotes full validation

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Validated By: Bill Fear

Reviewed By: Lisa Tyson

Samples MW-32-070104 (total) and MW-32-070104 (dissolved) were randomly selected for full validation. Cursory validation was conducted on all remaining sample analyses. The data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation
* Calibrations
* Blanks
* Interference Check Samples
* Matrix Spike/Matrix Spike Duplicates
* Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
* Serial Dilution for ICP Analysis
* Analyte Quantitation and Reporting Limits (full validation only)

* **All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficients for mercury were greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery criteria.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on sample MW-33-070104 (total and dissolved).

All MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the un-spiked sample amount was greater than 4 times the spike value and the recoveries were not applicable.

The laboratory was evaluating the spike recoveries against the laboratory QC limits. As a result, the laboratory indicated that recoveries for aluminum were outside the laboratory percent recovery QC limits. No action was taken on these results because the recoveries were within 75-125%.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD relative percent differences (RPDs) and all RPDS were less than 20%. The RPD for dissolved mercury at 14% was flagged as exceeding the laboratory QC limit of 10%. No action was required.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses at the correct frequency. All recoveries were within 80-120%. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on MW-33-070104 (total and dissolved).

All %Ds were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. The results and reporting limits were correctly reported. No calculation or transcription errors were found.

All results were reported within the linear calibration range.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

U J - The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

NR - Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

BATCH: D4G010356

List all analytes which do not meet holding time criteria ICP Hg Trace ICPMS

	Sample ID (Totals)	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	~~CN~~ Analysis Date	ICPMS Analysis Date/s	No. of Days Past Holding Time	Action
1	MW-33-070104	H2O	A	7-1-04	7-22-04	7-14-04	7-13-04	7-12-04	-0-	None
2	MW-34									
3	MW-31									
4	MW-32									
5	MW-30									
	Dissolved									
1	MW-33	H2O	A	7-1-04	7/22/04	7-14-04	7/13/04	7-12-04		
2	MW-34									
4	MW-32									
6	MW-36									

COMMENTS 2.7°C Full on MW32- T+D

Cl #4

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: Bill G— Date:

Review By: L. Ryan Date:

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

***VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.**

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

BATCH: 04G010354

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
					—	All w/in 90-110%
						ICP ✓
						True ✓
						ICP-MS ✓
					None	

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS CRI ✓

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. ***If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).***

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: D4G010354

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
				none	— w/in 80-120

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No

2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.99999

If no, list affected analytes and samples:

3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No

4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

TECHLAW

III. INORGANIC ANALYSIS WORKSHEET -- BLANKS

MATRIX: H_2O BATCH: D84010356

List the highest positive AND negative blank result >=|IDL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
	PB D					ORC
	PB T		ND			
	ICB	All ND				
	CCB					

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify

One prep blank per matrix

One prep blank per batch

ICB analyzed immediately after ICV

CCB analyzed after each CCV.

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

TECHLAW

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D4G 040354

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
				#4 T&D
				none > ICSA

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
		—	All w/in 80-120%
			NA ICSA

CLP Protocol Only
Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8 hour shift (whichever is more frequent)? Yes No

COMMENTS

no quals

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

TECHLAW

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: H2O BATCH: D4C010356

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
T 01T	Al				120	✓	w/in 75-125
					121	✓	accept.
D 01D	Hg				—	ok	

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:
Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET – LABORATORY DUPLICATES

MATRIX: A20 BATCH: D4G010356

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
01D	Hg			14	—	—	<20
							lab using 10%.
							MS/MSD
							105 (91 - 141)
					None		

COMMENTS

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|
Include outliers for field duplicates (if applicable)
<u>Note</u>
A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

TECHLAW

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX: H_2O BATCH: D4G010356

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
Total —						80-120
Dissolved —						80-120
					None	

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

1. AQUEOUS	PERCENT RECOVERY <50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: H2O

BATCH: P4G010356

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
Ba	0.33	16.5	2173	504	100	←	not reporting < RL
Mn	0.54	27	32	504	100		10x5= 50 ok
						none	

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: D4G010356

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

None ✓

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

OK ✓

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes No NA

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes No NA

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

COMMENTS

To RL ✓

No quals

100% Complete

DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Bill Fear – TechLaw, Inc.
Report Date: September 8, 2004
Project/Site: VB/I-70 OU3
Laboratory No.: D4E260121

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, and 7470A for Laboratory Lot No. D4E260121 from Severn Trent Laboratories, Inc. This report consists of the validation of three total and four dissolved water samples collected on May 21 and 24, 2004 and analyzed on June 1 and 4, 2004 for ICP metals; June 19, 2004 for ICPMS; and on June 6, 2004 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
MW-33-052104 (total)	D4E260121-001
MW-33-052104 (dissolved)	D4E260121-001
MW-34-052104 (total) +	D4E260121-002
MW-34-052104 (dissolved) +	D4E260121-002
MW-36-052104 (total)	D4E260121-003
MW-35-052404 (dissolved)	D4E260121-004
MW-36-052404 (dissolved)	D4E260121-005

+ denotes full validation

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Validated By: Bill Fear

Reviewed By: Lisa Tyson

Samples MW-34-052104 (total) and MW-34-052104 (dissolved) were randomly selected for full validation. Cursory validation was conducted on all remaining sample analyses. The data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation
  Calibrations
* Blanks
  Interference Check Samples
  Matrix Spike/Matrix Spike Duplicates
* Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
  Serial Dilution for ICP Analysis
* Analyte Quantitation and Reporting Limits (full validation only)

*** All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficients for mercury were greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery with the exception of recoveries for beryllium (110.9%, 110.9%, and 114.5%) and thallium (112.1%) in CCV standards bracketing the samples. No action was required as beryllium and thallium were non-detected in the associated sample analyses.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks with the exception of arsenic in one CCB at 0.118 ug/L. No action was required as the sample results were non-detected or greater than five times the blank value. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

The results for calcium in the full validation samples MW-34-052104 (total) and MW-34-052104 (dissolved) exceeded the ICSA value of 500 ppm.

The following sample results were qualified as estimated (J/UJ) because the calcium result was greater than the ICSA value and the absolute value of the associated element was greater than the MDL in the ICSA analysis:

- Silver, vanadium, and cadmium in samples MW-34-052104 (total) and MW-34-052104 (dissolved)

Silver and vanadium were reported in the ICSA at –6.2 ug/L and –8.5 ug/L, respectively, which exceeds the positive MDLs of 0.7 ug/L and 2.6 ug/L. Non-detected results are qualified as estimated for negative ICSA values. Cadmium was reported at 2.04 ug/L, which exceeds the MDL of 0.028 ug/L. Detected results less than five times the ICSA value are qualified as estimated.

No action was required for additional analytes reported above the MDL in the ICSA, as the sample results were greater than five times the ICSA value.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on samples MW-33-052104, MW-34-052104, and on a sample from another SDG.

The following detected sample results were qualified as estimated (J) because the associated spike recoveries at 133% and 135% recoveries were greater than 125%:

- Total aluminum in samples MW-33-052104, MW-34-052104, and MW-36-052104.

All other MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the un-spiked sample amount was greater than 4 times the spike value and the recoveries were not applicable.

The laboratory was evaluating the spike recoveries against the laboratory QC limits. As a result, the laboratory indicated that recoveries for total beryllium and thallium were outside the laboratory percent recovery QC limits. No action was taken on these results because the recoveries were within 75-125%.

The post-digestion spike recovery for antimony was within QC limits. Post digestion recoveries do not effect sample qualifications.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD relative percent differences (RPDs) and all RPDS were less than 20%.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses at the correct frequency. All recoveries were within 80-120%. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on samples MW-33-052104, MW-34-052104, and on a sample from another SDG.

The following detected sample results were qualified as estimated (J) because the serial dilution %D exceeded 10% for analyte concentrations greater than 50 times the MDLs:

- Total arsenic in samples MW-33-052104 and MW-36-052104.

The serial dilution result for arsenic was not flagged by the laboratory. All other %Ds were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. The results and reporting limits were correctly reported. No calculation or transcription errors were found.

All results were reported within the linear calibration range.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R	-	Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
J	-	The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
U J	-	The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.
U	-	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
NR	-	Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

D4E260121

I. INORGANIC ANALYSIS WORKSHEET – HOLDING TIMES

TECHLAW

BATCH: D4E260121

List all analytes which do not meet holding time criteria

Sample ID (Total)	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s (ICP)	*Hg CVAA Analysis Date	Trace ~~CN~~ Analysis Date	ICP MS Analysis Date/s	No. of Days Past Holding Time	Action
1 MW-33-052104	AQ	HNO3	5/21/04	6/4	6/6/04	6/1	6/18	-0-	None
2 MW-34									
3 MW-36									
4 ~~MW-35-052404~~			5/24/04						
5 ~~MW-36~~									
(Dissolved)									
1 MW-33-052104	AQ	A	5/21	6/4	6/6	6/1	6/18		
2 MW-34-052104									
4 MW-35-052404			5/24						
5 MW-36-052404									
Trace	Ba, Cr, Co,	Cu, Pb	Mn	Ni, Se	Ag, V, Zn				
ICP	Al,	Ca, Fe,	Mg, K,	Na					
ICPMS	Sb, As,	Be	Cd,	Tl					

COMMENTS

6010B 6020, 7470A → C.5°C

Full validation on (MW34-052104 T+D)

Actions:
1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: Bill F Date:

Review By: L. Tyson Date:

Preservatives:
A. Preserved w/HNO3 and cooled to 4°C ✓
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

***VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.**

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

BATCH: D4E260121

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
Be	CCV2	50	55.45	110.9	none	(all Totals)
	CCV7		55.44	110.9		
	8		57.23	114.5		w/ Diss
TL	CCV8		56.03	112.1		
						Be & TL - ND
						in associated samples
						57.23 / 50 = 114.46

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS CRI error

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. **If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).**

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: D4E 260121

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
				—	w/in 80-120%
				NONE	

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.99993
   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

	<65%	65-79%	80-120%	121-135%	>135%
	PERCENT RECOVERY				
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

TECHLAW

III. INORGANIC ANALYSIS WORKSHEET -- BLANKS

MATRIX: H2O BATCH: D9E260121

List the highest positive AND negative blank result >=|DL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
As	CCB4	0.059	0.118	0.59	—	no q's
	RL=	1.0				

No actions

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify

One prep blank per matrix

One prep blank per batch

ICB analyzed immediately after ICV

CCB analyzed after each CCV.

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

TECHLAW

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: P4E260121

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
				CAT 6.f no
				action
				required

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
		—	All within 80-120%.
			~~All samples~~

CLP Protocol Only
Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

TECHLAW

IVB. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D4E260121

#2T #2D

Note: For the CLP protocol only, report the concentration of any analytes detected in the ICSA solution > |IDL| that should not be present (apply only to samples with elements identified at concentrations above the ICSA on the previous page).

Analyte	ICSA Result	Action	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result
Ba			↑					
Cd			ND					
Co			ND					
Cu	13		>5x					
Pb			ND					
Mn			↑					
Ag	-6.2	UJ	ND	UJ ND				
	(6.7)							
V	-8.5	UJ	ND	UJ ND				
	(26)							
Cd	2.04	J	7.5	5.9				
As	[illegible]							
		C>RL	0.024					

Actions:

Full val only

If the ICSA value > the positive IDL:
1. For non-detected results, no action is taken.
2. Estimate (J) all detected results <= 5*ICSA.

If the ICSA value < -IDL:
1. Estimate (J) detected results <= 5* |ICSA|.
2. Estimate (UJ) non-detected results.

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: H_2O BATCH: D4E260121

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

T

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
01T	Al	3240	580	2000	133	J	total Al All
		3240	↓		135	J	
Another	Be				81		
SDG					81	none	outside lcs but
	Tl				82		w/in 75-125
					83		
01D	ICS	<01					
02D	ICP	CA >	4x	2000			
		NA >	4x	—			
Another SDG	—	Hg D	<012				
							using 2nd value?
							220 / 200 = 110 e 107
							Tl 74.4/100 = 74 e 82

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No	
2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA	
3. Was a matrix spike prepared for each different sample matrix? Yes No	
COMMENTS	No post for Al

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: H2O BATCH: D4E260121

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
						None	ALL RPDs <20
							use ms/msd

COMMENTS

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|
Include outliers for field duplicates (if applicable)

<u>Note</u>

A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

VII. INORGANIC ANALYSIS WORKSHEET – LABORATORY CONTROL SAMPLES

MATRIX: H2O BATCH: D4E260121

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
					—	All w/in 80-120
					None	
						5/21/08 =107–

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

	PERCENT RECOVERY			
1. AQUEOUS	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS
Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

TECHLAW

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: H2O

BATCH: D4E260121

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
Ba	0.37	18.5	29	50 U	100	—	not reporting < RL
							10 × 5 = 50 → 50U
Al	20	1000	< 50	—			
As	0.094	4.7	5.3	6.5	23%	J	total Arsenic
on order SPh							01, 03
							Nothing #2 - no

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: DEE260121

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

None

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

None

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes No NA

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes No NA

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

COMMENTS

Form 14 does not indicate Total vs. D.ss.

NOE RLs.

DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Bill Fear – TechLaw, Inc.
Report Date: September 8, 2004
Project/Site: VB/I-70 OU3
Laboratory No.: D4E040112

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, and 7470A for Laboratory Lot No. D4E040112 from Severn Trent Laboratories, Inc. This report consists of the validation of one total and one dissolved water sample collected on May 3, 2004 and analyzed on May 14, 15, and 17, 2004 for ICP metals; May 17 and 18, 2004 for ICPMS; and on May 10 and 13, 2004 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
MW-33-050304 (total) +	D4E040112-001
MW-33-050304 (dissolved) +	D4E040112-001

+ denotes full validation

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Full validation was conducted on these analyses. The data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation
  Calibrations
* Blanks
* Interference Check Samples
  Matrix Spike/Matrix Spike Duplicates
* Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
* Serial Dilution for ICP Analysis
* Analyte Quantitation and Reporting Limits (full validation only)

* **All criteria were met for this parameter**

Validated By: Bill Fear Reviewed By: Lisa Tyson

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

No shipping or receiving problems were noted. The sample was hand delivered to the laboratory immediately after sampling was therefore not received cooled. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficients for mercury were greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery criteria with the exception of a recovery for beryllium (110.7%) in a CCV standard bracketing the dissolved sample analysis. No action was required as beryllium was non-detected in the associated sample analysis.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on sample MW-33-050304 and on a sample from another SDG.

The following non-detected sample result was qualified as estimated (UJ) because the associated spike recoveries at 33% and 34% recoveries were less than 75%, but greater than 30%:

- Total antimony in sample MW-33-050304

All other MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the un-spiked sample amount was greater than 4 times the spike value and the recoveries were not applicable.

The laboratory was evaluating the spike recoveries against the laboratory QC limits. As a result, the laboratory indicated that a recovery for cadmium was outside the laboratory percent recoveries QC limits. No action was taken on this result because the recovery was within 75-125%.

The post-digestion spike recovery for antimony was within QC limits. Post digestion recoveries do not effect sample qualifications.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD relative percent differences (RPDs) and all RPDS were less than 20%.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses at the correct frequency. All recoveries were within 80-120%. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on sample MW-33-050304 and on a sample from another SDG.

All %Ds were less than 10% or the initial sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. The results and reporting limits were correctly reported. No calculation or transcription errors were found.

All results were reported within the linear calibration range.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

U J - The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

NR - Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

TECHLAW

BATCH: D4E040112

List all analytes which do not meet holding time criteria

Sample ID	Matrix	List Pre-servative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	ICPMS ~~*CN Analysis~~ Date	Analysis Date/s	No. of Days Past Holding Time	Action
(1) MW-33-050304	H2O	HNO3	5/3/04	5/11,15	5/10/04	5/18		-0-	none
(Total)									
MW-33-050304	H2O	"	5/3/04	5/15,17	5/13/04	5/17			
(Diss)									
5/14-15 (Run #1)	T & D	→ Ba, Cr,	Co, Cu,	Pb, Mn	Ni, Se,	Ag, V, Zn			
5/14-15 Run #2	(T)	Al,	Ca, Fe,	Mg,	K, Na				
5/17 Run #3	(D)	Al,	Ca, Fe,	Mg,	K, Na				
ICPMS Run 1	D	Sb, As,	Cd, Be,	Tl					
Run 2	T								

COMMENTS — @ ambient 22.1°C recd immediately after sampling —
6010, 6020 7470A

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: Bill F Date:

Review By: L. Tyson Date:

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

***VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.**

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

BATCH: D4E040112

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
Be	CCV5	50	55.36	110.7	none	Diss (ICPMS)
						Sample is ND

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS Run #1 Tot ICV, CCV10, 11, 17, 18
6 7 8 9 CRI ✓
Run #2 Tot ICV, CCV5, 6 50-150 ✓
Run #3 D ICV CCV3, 4

Actions:

ICV/CCV Actions: ICPMS #1 D ICV C5, 6
ICPMS #2 (T) ICV C4, 5

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: 04E040112

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
					both runs
					ICV / CCVS 80-120

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No Run #1 0.99993
   If no, list affected analytes and samples: Run #2 0.99988
3. Was a CRDL check sample (CRA) analyzed at the beginning of each ~~sample run? (CLP only)~~ Yes No ✓
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

III. INORGANIC ANALYSIS WORKSHEET -- BLANKS

MATRIX: H2O BATCH: 04E04042

List the highest positive AND negative blank result >=|IDL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
						(T)PB - All <RL
						D " "
					None	All ICB/CCB w/
						<RL
						ICS reporting to RL

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *
Verify
One prep blank per matrix
One prep blank per batch
ICB analyzed immediately after ICV
CCB analyzed after each CCV.
Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.
COMMENTS

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).
* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

TECHLAW

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D4E040442

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
				None > ICSA

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
	—	None	
			N/A ICSAB
			(no run)

CLP Protocol Only
Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

TECHLAW

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: H_2O BATCH: D4E040112

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
T 01	Sb(T)	13.2		40	33	J/R	total
		13.7		1	34		
D Anlys	ICP						
Sx			w/in	75-125%			
01	ICP-MS						
							Al, Fe 74%
							RPD - ok
							13.2/40 x100 = 33
							Software using final
							value for MS
							ie 43.3/40 = 108
							125 was 100

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS Note CZ 113% at site 125 but w/in 75-125

Post spike for Sb - 96.5% - no qual change.

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: H_2O BATCH: D4E640112

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
							All MS/MSD
							RPDs w/in
							QC limits
							(20%)

COMMENTS CA $\frac{125-116}{120.5} = 7.5$ ✓

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|
Include outliers for field duplicates (if applicable)

Note

A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

TECHLAW

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX: A2O BATCH: 04E040112

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
Total					80-120%	
Diss						

Note:

LCS with the same matrix as samples must be prepared for each SDG. within QC

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

1. AQUEOUS	<50%	50-79%	80-120%	>120%
		PERCENT RECOVERY		
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

TECHLAW

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: [illegible] BATCH: PLE 040112

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
					None		
						out	

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: D4E040112

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

none

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

✓

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes No NA

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes No NA

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

to RL results [illegible]

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

COMMENTS [illegible] 10 [illegible] results [illegible] results < RL ✓

[illegible] has [illegible] of 5 [illegible]

[illegible] using RL of 1 [illegible] MDL is < ~~0~~ 1.0

[illegible] Bi 0.223 ppm @ 220 ppb

[illegible] 0.026 @ 26

Fe 27.737 > 28,000

[illegible] CZ [illegible] 68.4 ✓

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DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Bill Fear – TechLaw, Inc.
Report Date: September 8, 2004
Project/Site: VB/I-70 OU3
Laboratory No.: D4G280388

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, and 7470A for Laboratory Lot No. D4G280388 from Severn Trent Laboratories, Inc. This report consists of the validation of four total and five dissolved water samples collected on July 28, 2004 and analyzed on August 4, 6 and 7, 2004 for ICP metals; August 9 and 12, 2004 for ICPMS; and on August 12 and 13, 2004 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
MW-33-072804 (total)	D4G280388-001
MW-33-072804 (dissolved)	D4G280388-001
MW-31-072804 (total)	D4G280388-002
MW-34-072804 (total)	D4G280388-003
MW-34-072804 (dissolved)	D4G280388-003
MW-32-072804 (total) +	D4G280388-004
MW-32-072804 (dissolved) +	D4G280388-004
MW-36-072804 (dissolved)	D4G280388-005
MW-35-072804 (dissolved)	D4G280388-006

+ denotes full validation

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Validated By: Bill Fear

Reviewed By: Lisa Tyson

Samples MW-32-072804 (total) and MW-32-072804 (dissolved) were randomly selected for full validation. Cursory validation was conducted on all remaining sample analyses. The data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation
  Calibrations
* Blanks
* Interference Check Samples
* Matrix Spike/Matrix Spike Duplicates
* Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
* Serial Dilution for ICP Analysis
* Analyte Quantitation and Reporting Limits (full validation only)

* **All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficients for mercury were greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery with the exception of a recovery for beryllium (110.8%) in a CCV standard bracketing two total samples. No action was required as beryllium was non-detected in the associated sample analyses.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks with the exception of cobalt in one CCB at 0.0.67 ug/L and for manganese in one CCB at 1.0 ug/L. No action was required as the sample results were non-detected or greater than five times the blank values. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on samples MW-33-072804 (total) and MW-31-072804 (total) and on samples from another SDG.

All MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the un-spiked sample amount was greater than 4 times the spike value and the recoveries were not applicable.

The laboratory was evaluating the spike recoveries against the laboratory QC limits. As a result, the laboratory indicated that a recovery for mercury at 81% was outside the laboratory percent recovery QC limits. No action was taken because the recovery was within 75-125%.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD relative percent differences (RPDs) and all RPDS were less than 20%.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses at the correct frequency. All recoveries were within 80-120%. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on samples MW-33-072804 (total) and MW-31-072804 (total) and on samples from another SDG.

All %Ds were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. The results and reporting limits were correctly reported. No calculation or transcription errors were found.

All results were reported within the linear calibration range.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

U J - The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

NR - Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

BATCH: D4G250258

List all analytes which do not meet holding time criteria

Sample ID	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	Trace ~~*CN Analysis~~ Date	ICP MS Analysis Date/s	No. of Days Past Holding Time	Action
1 mw-33-072804	H2O	A	7/28/04	8-6-04	8-13-04	8-9-04	8-9-04	-0-	None
2 mw-31-072804									
3 mw-34-072804									
4 mw-32-072804									
5 ~~mw-36-072804~~						2-[illegible]			
								+ 8/16	
							8/17		Form 1 [illegible]
Dissolved									
1 mw-33			7/28/04	8/7/04	8-12-04	~~8/16/04~~	8-12-04		
3 mw-34									
4 mw-32									
5 mw-36									
6 mw-35									
					NO Hg for		mw-35 D		

COMMENTS 3.2°C

Full DV on mw-32 T&D

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: Bill F[illegible] Date:

Review By: L. Tyson Date:

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

*VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

BATCH: D4G220388

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
5/12 Be	CCV~~4~~	50	55.4	110.8	None	5/4/04 #1 ICV CCV6, CCV7 ✓
					with ND	(72-31)
						5/4/04 run #2 ICV CCV5, 6
						(7-4221)
						5/6 ICP ICV CCV3-5 ✓
						~~Trace~~
						Trace 8/27 ICV 5-6 ✓
						5/6/8/7 ICP ICV 5-6 ✓
						5/8 ICP-MS ICV 2-4 ✓
						5/11 ICP-MS

No Action

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS 5/12 ICP-MS - on 5 Dissolve 50 - 50 -

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. **If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).**

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: D4G200358

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
					— 80-120 [illegible] —
				None	

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.99993 1.0 99937
   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No CRA ✓
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. **If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).**
2. **If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).**

TECHLAW

III. INORGANIC ANALYSIS WORKSHEET -- BLANKS

MATRIX: H2O BATCH: D4G280288

List the highest positive AND negative blank result >=|DL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
Co	CCB4	5 lower 2	0.67	3.35	—	ND or > 5x (37, 32 T)
Mn	CCB5	1	1.0	5.0	—	
					none	

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify

One prep blank per matrix /

One prep blank per batch /

ICB analyzed immediately after ICV /

CCB analyzed after each CCV.

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).
* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

TECHLAW

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D462E0358

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
				#4 TAD
				None > ICSA

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
			All total
			None out

CLP Protocol Only
Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

TECHLAW

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: H_2O BATCH: D4G280358

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
#27	ICP-MS						75-125 ✓
#17	ICP						75-125 ✓
Another SDG Hg(T)							✓
Another SDG							
Diss	ICP /	ICP-MS					75-125 or >4x
		Hg			Flagged	@ 81%	(54-101)
						none	w/in 75-125
						✓	

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS

No actions

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: H_2O BATCH: DG428025

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
							MS/MSD
							RPDs all <20%.

COMMENTS

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|
Include outliers for field duplicates (if applicable)
Note
A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX: H2O BATCH: D4G 240808

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
						Total 80-120 ✓
						Diss ✓
					None ✓	

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

1. AQUEOUS	<50%	50-79%	80-120%	>120%
		PERCENT RECOVERY		
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

TECHLAW

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: H_2O　　　　BATCH: 04G280388

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
Ba							no @ ec...
Mn							SD results to ec

None OK

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: D4G280358

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

None.

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

All w/in RANGE

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes No NA

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes No NA TO RL

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

7. Were all sample results reportec down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

COMMENTS

ND @ RL

None

ROUND 2: GROUNDWATER VALIDATION REPORTS

SDG: *D4E040112*
SDG: *D4E260121*
SDG: *D4G010356*
SDG: *D4G280388*

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DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Bill Fear – TechLaw, Inc.
Report Date: September 8, 2004
Project/Site: VB/I-70 OU3
Laboratory No.: D4G010356

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, and 7470A for Laboratory Lot No. D4G010356 from Severn Trent Laboratories, Inc. This report consists of the validation of five total and four dissolved water samples collected on July 1, 2004 and analyzed on July 13 and 22, 2004 for ICP metals; July 12, 2004 for ICPMS; and on July 14, 2004 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
MW-33-070104 (total)	D4G010356-001
MW-33-070104 (dissolved)	D4G010356-001
MW-34-070104 (total)	D4G010356-002
MW-34-070104 (dissolved)	D4G010356-002
MW-31-070104 (total)	D4G010356-003
MW-32-070104 (total) +	D4G010356-004
MW-32-070104 (dissolved) +	D4G010356-004
MW-30-070104 (total)	D4G010356-005
MW-36-070104 (dissolved)	D4G010356-006

+ denotes full validation

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Validated By: Bill Fear
Bill Fear

Reviewed By:
Lisa Tyson

Samples MW-32-070104 (total) and MW-32-070104 (dissolved) were randomly selected for full validation. Cursory validation was conducted on all remaining sample analyses. The data were evaluated based on the following parameters:

* * Data Completeness
* * Holding Times and Preservation
* * Calibrations
* * Blanks
* * Interference Check Samples
* * Matrix Spike/Matrix Spike Duplicates
* * Duplicate Samples
* * Blank Spikes (Laboratory Control Samples)
* * Serial Dilution for ICP Analysis
* * Analyte Quantitation and Reporting Limits (full validation only)

* **All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficients for mercury were greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery criteria.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on sample MW-33-070104 (total and dissolved).

All MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the un-spiked sample amount was greater than 4 times the spike value and the recoveries were not applicable.

The laboratory was evaluating the spike recoveries against the laboratory QC limits. As a result, the laboratory indicated that recoveries for aluminum were outside the laboratory percent recovery QC limits. No action was taken on these results because the recoveries were within 75-125%.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD relative percent differences (RPDs) and all RPDS were less than 20%. The RPD for dissolved mercury at 14% was flagged as exceeding the laboratory QC limit of 10%. No action was required.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses at the correct frequency. All recoveries were within 80-120%. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on MW-33-070104 (total and dissolved).

All %Ds were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. The results and reporting limits were correctly reported. No calculation or transcription errors were found.

All results were reported within the linear calibration range.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

U J - The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

NR - Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

BATCH: D4G010356

List all analytes which do not meet holding time criteria ICP Hg Trace ICPMS

	Sample ID (totals)	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	~~*CN~~ Analysis Date	ICPMS Analysis Date/s	No. of Days Past Holding Time	Action
1	MW-33-070104	H2O	A	7-1-04	7-22-04	7-14-04	7-13-04	7-12-04	-0-	None
2	MW-34									
3	MW-31									
4	MW-32									
5	MW-30									
	Dissolved									
1	MW-33	H2O	A	7-1-04	7/22/04	7-14-04	7/13/04	7-12-04		
2	MW-34									
4	MW-32									
6	MW-36									

COMMENTS 2.7°C Full on MW32 - T+D

Lab #4

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: [signature] Date:

Review By: [signature] Date:

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

*VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

BATCH: D4G010354

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
					—	All w/in 90-110
						ICP ✓
						Trace ✓
						ICPMS ✓
					None	

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS CRI ✓

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: D4G010754

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
				none	— w/in 80-120.

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No

2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.99999

If no, list affected analytes and samples:

3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No

4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

TECHLAW

III. INORGANIC ANALYSIS WORKSHEET -- BLANKS

MATRIX: H_2O BATCH: DG4010356

List the highest positive AND negative blank result >=|IDL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
	PB D					ℓ RL
	PB T		ND			
	ICB	All	ND			
	CCB					

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify

One prep blank per matrix

One prep blank per batch

ICB analyzed immediately after ICV

CCB analyzed after each CCV.

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D4G 00354

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
				#4 T&D
				none > ICSA

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
		—	All w/in 80-120%
			NA ICSA

CLP Protocol Only
Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS

no quals

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

V. INORGANIC ANALYSIS WORKSHEET – PRE-DIGESTION MATRIX SPIKE

MATRIX: H2O BATCH: D4C010356

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

	Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
T	01T	Al				120	/	w/in 75-125
						121	/	at-site lot
D	01D	Hg				—	ok	
							None	

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: A2O BATCH: 04 G010354

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
01D	Hg			14			<20
							105 using 101.
							MS/MSD
							105 (51 - 141)
						None	

COMMENTS

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|
Include outliers for field duplicates (if applicable)
Note
A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

VII. INORGANIC ANALYSIS WORKSHEET – LABORATORY CONTROL SAMPLES

MATRIX: H2O BATCH: D4G010356

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
Total						80-120
Dissolved						80-120
					None	

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

1. AQUEOUS	<50%	50-79%	80-120%	>120%
		PERCENT RECOVERY		
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

TECHLAW

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: H2O BATCH: D46010356

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
Ba	0.33	16.5	2173	504	100	←	not reporting < RL
Mn	0.44	22	32	504	100		10×5= 50 ok

none

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: 04G010356

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

none ✓

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

OK ✓

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes No NA

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes No NA

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

COMMENTS

To RL

no quals

100% complete

DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Bill Fear – TechLaw, Inc.
Report Date: September 8, 2004
Project/Site: VB/I-70 OU3
Laboratory No.: D4E260121

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, and 7470A for Laboratory Lot No. D4E260121 from Severn Trent Laboratories, Inc. This report consists of the validation of three total and four dissolved water samples collected on May 21 and 24, 2004 and analyzed on June 1 and 4, 2004 for ICP metals; June 19, 2004 for ICPMS; and on June 6, 2004 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
MW-33-052104 (total)	D4E260121-001
MW-33-052104 (dissolved)	D4E260121-001
MW-34-052104 (total)⁺	D4E260121-002
MW-34-052104 (dissolved)⁺	D4E260121-002
MW-36-052104 (total)	D4E260121-003
MW-35-052404 (dissolved)	D4E260121-004
MW-36-052404 (dissolved)	D4E260121-005

⁺ denotes full validation

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Validated By: [signature]
Bill Fear

Reviewed By: [signature]
Lisa Tyson

Samples MW-34-052104 (total) and MW-34-052104 (dissolved) were randomly selected for full validation. Cursory validation was conducted on all remaining sample analyses. The data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation
  Calibrations
* Blanks
  Interference Check Samples
  Matrix Spike/Matrix Spike Duplicates
* Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
  Serial Dilution for ICP Analysis
* Analyte Quantitation and Reporting Limits (full validation only)

*** All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficients for mercury were greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery with the exception of recoveries for beryllium (110.9%, 110.9%, and 114.5%) and thallium (112.1%) in CCV standards bracketing the samples. No action was required as beryllium and thallium were non-detected in the associated sample analyses.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks with the exception of arsenic in one CCB at 0.118 ug/L. No action was required as the sample results were non-detected or greater than five times the blank value. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

The results for calcium in the full validation samples MW-34-052104 (total) and MW-34-052104 (dissolved) exceeded the ICSA value of 500 ppm.

The following sample results were qualified as estimated (J/UJ) because the calcium result was greater than the ICSA value and the absolute value of the associated element was greater than the MDL in the ICSA analysis:

- Silver, vanadium, and cadmium in samples MW-34-052104 (total) and MW-34-052104 (dissolved)

Silver and vanadium were reported in the ICSA at –6.2 ug/L and –8.5 ug/L, respectively, which exceeds the positive MDLs of 0.7 ug/L and 2.6 ug/L. Non-detected results are qualified as estimated for negative ICSA values. Cadmium was reported at 2.04 ug/L, which exceeds the MDL of 0.028 ug/L. Detected results less than five times the ICSA value are qualified as estimated.

No action was required for additional analytes reported above the MDL in the ICSA, as the sample results were greater than five times the ICSA value.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on samples MW-33-052104, MW-34-052104, and on a sample from another SDG.

The following detected sample results were qualified as estimated (J) because the associated spike recoveries at 133% and 135% recoveries were greater than 125%:

- Total aluminum in samples MW-33-052104, MW-34-052104, and MW-36-052104.

All other MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the un-spiked sample amount was greater than 4 times the spike value and the recoveries were not applicable.

The laboratory was evaluating the spike recoveries against the laboratory QC limits. As a result, the laboratory indicated that recoveries for total beryllium and thallium were outside the laboratory percent recovery QC limits. No action was taken on these results because the recoveries were within 75-125%.

The post-digestion spike recovery for antimony was within QC limits. Post digestion recoveries do not effect sample qualifications.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD relative percent differences (RPDs) and all RPDS were less than 20%.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses at the correct frequency. All recoveries were within 80-120%. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on samples MW-33-052104, MW-34-052104, and on a sample from another SDG.

The following detected sample results were qualified as estimated (J) because the serial dilution %D exceeded 10% for analyte concentrations greater than 50 times the MDLs:

- Total arsenic in samples MW-33-052104 and MW-36-052104.

The serial dilution result for arsenic was not flagged by the laboratory. All other %Ds were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. The results and reporting limits were correctly reported. No calculation or transcription errors were found.

All results were reported within the linear calibration range.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

U J - The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

NR - Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

D4E260121-

BATCH: D4E260121

List all analytes which do not meet holding time criteria ICP

Sample ID (Total)	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	~~CN Analysis~~ Trace Date	ICP MS Analysis Date/s	No. of Days Past Holding Time	Action
1 MW-33-052104	AQ	HNO3	5/21/04	6/4	6/6/04	6/1	6/19	-0-	None
2 MW-34									
3 MW-36									
4 ~~MW-35-052404~~			5/24/04						
5 ~~MW-36~~									
(Dissolved)									
1 MW-33-052104	AQ	A	5/21	6/4	6/6	6/1	6/19		
2 MW-34-052104									
4 MW-35-052404			5/24						
5 MW-36-052404									
Trace	Be, Cr, Co, Cu, Pb	Mn	Ni, Se, Ag, V, Z						
ICP	Al, Ca, Fe, Mg, K, Ag								
ICPMS	Sb, As, Be	Cd, Tl							

COMMENTS

6010B 6020, 7470A → C.5°C

Full validation on (MW34-052104 T+D)

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: Bill F Date:

Review By: L. Tyson Date:

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C ✓

B. Cooled to 4°C

C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

*VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

BATCH: D4E260121

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
Be	CCV2	50	55.45	110.9	none	[illegible]
↓	CCV7	↓	55.44	110.9	↓	7
↓	8	↓	57.23	114.5	↓	[illegible]
TL	CCV8	↓	56.23	112.1	↓	
						Be & TL - ND
						in associated samples
						57.23 / 50 = 114.46

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS [illegible]

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. **If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).**

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: D4E 260121

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
				—	w/in 80-120%
				none	

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.99993
   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. *If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).*

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

III. INORGANIC ANALYSIS WORKSHEET -- BLANKS

MATRIX: H2O BATCH: DHE260121

List the highest positive AND negative blank result >=|IDL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
As	CCB4	0.054	0.118	0.59	—	No. & RL
	RL=	1.0				

No actions

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify

One prep blank per matrix

One prep blank per batch

ICB analyzed immediately after ICV

CCB analyzed after each CCV.

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).
* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

TECHLAW

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: P4E260121

NOTE: *The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.*

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
				CA↑ but no
				action
				required

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
		—	All within 80-120%.
			~~All samples~~

CLP Protocol Only
Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

IVB. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

#2T #2D BATCH: D4E260121

Note: For the CLP protocol only, report the concentration of any analytes detected in the ICSA solution > |IDL | that should not be present (apply only to samples with elements identified at concentrations above the ICSA on the previous page).

Analyte	ICSA Result	Action	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result	Sample/ Result
Ba			↑					
Cd			ND					
Co			ND					
Cu	1.0		75*					
Pb			ND					
Mn			9					
Ag	-6.2	UJ	ND	UJ ND				
	(6.7)							
V	-8.5	UJ	ND	UJ ND				
	(26)							
Cr	2.04	J	7.5	5.9				
As	<MDL							
		C>IDL	0.024					

Full val only

Actions:

If the ICSA value > the positive IDL:
1. For non-detected results, no action is taken.
2. Estimate (J) all detected results < = 5*ICSA.

If the ICSA value < -IDL:
1. Estimate (J) detected results < = 5* |ICSA|.
2. Estimate (UJ) non-detected results.

V. INORGANIC ANALYSIS WORKSHEET – PRE-DIGESTION MATRIX SPIKE

MATRIX: H_2O BATCH: DYE 260121

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.
If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

T

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
01T	Al	3240	580	2000	133	J	total Al All
		3200	↓		135	J	
Another	Be				81		
526					81	none	outside lcs but
	Tl				82		w/in 75-125
					83		
01D	Icems	– OK					
02D	ICP –	CA >	4x	2800			
		NA >	4x	–			
Duplicate	–	Hg D	– OK				
							Hg 4-7 2nd value?
							220 ^{2800} = lot e101
							Tl M.4100 = lot e12

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS No post for Al

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:
Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note
If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: A.20 BATCH: D4E260121

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
							ALL RPDs <20
						None	
							use ms/msd

COMMENTS

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|
Include outliers for field duplicates (if applicable)

Note

A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

VII. INORGANIC ANALYSIS WORKSHEET – LABORATORY CONTROL SAMPLES

MATRIX: H2O BATCH: D4E260121

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
					—	All w/in 80-120
					None	
						5/21/00 [illegible]

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

	PERCENT RECOVERY			
1. AQUEOUS	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

TECHLAW

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: H2O BATCH: D4E260121

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
Ba	0.37	18.5	29	50 U	100	—	not reporting < RL
							10 x 5 = 50 → 50U
Al	20	1000	< 50 A				
As	0.094	4.7	5.3	6.5	23 %	J	total Arsenic
On order sph							01, 03
							Noction # 2 - no

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: DLE260121

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

None

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

None

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes No NA

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes No NA

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

COMMENTS

Form 14 does not indicate Total vs. D.ss.

None @ RLs.

DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Bill Fear – TechLaw, Inc.
Report Date: September 8, 2004
Project/Site: VB/I-70 OU3
Laboratory No.: D4E040112

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, and 7470A for Laboratory Lot No. D4E040112 from Severn Trent Laboratories, Inc. This report consists of the validation of one total and one dissolved water sample collected on May 3, 2004 and analyzed on May 14, 15, and 17, 2004 for ICP metals; May 17 and 18, 2004 for ICPMS; and on May 10 and 13, 2004 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
MW-33-050304 (total) +	D4E040112-001
MW-33-050304 (dissolved) +	D4E040112-001

+ denotes full validation

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Full validation was conducted on these analyses. The data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation
  Calibrations
* Blanks
* Interference Check Samples
  Matrix Spike/Matrix Spike Duplicates
* Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
* Serial Dilution for ICP Analysis
* Analyte Quantitation and Reporting Limits (full validation only)

*** All criteria were met for this parameter**

Validated By: Bill Fear
Reviewed By: Lisa Tyson

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

No shipping or receiving problems were noted. The sample was hand delivered to the laboratory immediately after sampling was therefore not received cooled. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficients for mercury were greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery criteria with the exception of a recovery for beryllium (110.7%) in a CCV standard bracketing the dissolved sample analysis. No action was required as beryllium was non-detected in the associated sample analysis.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on sample MW-33-050304 and on a sample from another SDG.

The following non-detected sample result was qualified as estimated (UJ) because the associated spike recoveries at 33% and 34% recoveries were less than 75%, but greater than 30%:

- Total antimony in sample MW-33-050304

All other MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the un-spiked sample amount was greater than 4 times the spike value and the recoveries were not applicable.

The laboratory was evaluating the spike recoveries against the laboratory QC limits. As a result, the laboratory indicated that a recovery for cadmium was outside the laboratory percent recoveries QC limits. No action was taken on this result because the recovery was within 75-125%.

The post-digestion spike recovery for antimony was within QC limits. Post digestion recoveries do not effect sample qualifications.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD relative percent differences (RPDs) and all RPDS were less than 20%.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses at the correct frequency. All recoveries were within 80-120%. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on sample MW-33-050304 and on a sample from another SDG.

All %Ds were less than 10% or the initial sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. The results and reporting limits were correctly reported. No calculation or transcription errors were found.

All results were reported within the linear calibration range.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

U J - The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

NR - Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

BATCH: D4E040112

List all analytes which do not meet holding time criteria

Sample ID	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	ICPMS ~~*CN Analysis~~ Date	Analysis Date/s	No. of Days Past Holding Time	Action
(1) MW-33-050304	H2O	HNO3	5/3/04	5/14,15	5/6/04	5/18		-0-	none
(Total)									
MW-33-050304	H2O	"	5/3/04	5/15,17	5/13/04	5/17			
(Diss)									
5/14-15 (Run #1)	T&D →	Ba, Cr,	Co, Cu,	Pb, Mn	Ni, Se, Ag, V, Zn				
5/17-15 Run #2	(T)	Al, CA, Fe	Mg,	K, NA					
5/17 Run #3	(D)	Al, CA, Fe	Mg,	K, NA					
ICPMS Run 1	D	Sb, As,	Cd,	Be, TL					
Run 2	T								

COMMENTS — @ ambient 22.1°C rec'd immediately after sampling —
6010, 6020 7470A

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: [signature] Date:

Review By: L. Tyson Date:

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

***VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.**

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

BATCH: D4E040112

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
Be	CCV5	50	55.36	110.7	none	Diss (ICPMS)
						Sample is ND

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS Run #1 ICP ICV, CCV10, 11, 17, 18
6 7 8 9 CRI ✓
Run #2 Tot ICV, CCV5, 6 solution
Run #3 D ICV CCV3, 4

Actions:

ICV/CCV Actions: ICPMS #1 D ICV C5, 6
ICPMS #2 (T) ICV C4 5

PERCENT RECOVERY

	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. **If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).**

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: 04E040112

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
					both runs
					ICV / CCVs 80-120
				None	

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No Run #1 0.99993
   If no, list affected analytes and samples: Run #2 0.99988
3. Was a CRDL check sample (CRA) analyzed at the beginning of each ~~sample run? (CLP only)~~ Yes No ✓
4. CCV run after CRA. every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the Instrument was set up, qualify the data as rejected (R).

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

TECHLAW

III. INORGANIC ANALYSIS WORKSHEET -- BLANKS

MATRIX: H2O

BATCH: D4E040412

List the highest positive AND negative blank result >=|IDL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
						(T) PB - All < IDL e.c.
						D " "
					None	All ICB/CCB w/
						e.c.
						ICs reporting to RL

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify

One prep blank per matrix

One prep blank per batch

ICB analyzed immediately after ICV

CCB analyzed after each CCV.

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D4E040442

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
				None > ICSA

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
	—	[illegible]	
			N/A ≥ ICSAB
			(no run)

CLP Protocol Only
Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

TECHLAW

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: A2O BATCH: D4E040112

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
T 01	Sb(T)	13.2	/	40	33	J/UJ	total
		13.7	/	1	34		
D Analyses	ICP						
Sx			w/in	75-125			
01	ICP(ms)						
							Al, Fe 74%
							RPD - ok
							13.2/40 x100 = 33
							Software using found
							value for MS
							ie 43.3/40 = 108
							les than 100

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS Note CZ 113% otherwise ICS 6-7 w/in 75-125

Post spike for Sb - 96.8% - no qual change.

4. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: H_2O BATCH: D4E640112

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
							All MS/MSD
							RPDs w/in
							QC limits
							(20%)

COMMENTS CA $\frac{125-114}{120.5}$ > 7.5 ✓

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|
Include outliers for field duplicates (if applicable)

Note

A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX: H2O BATCH: D9E040142

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
Total					80-	120%
Diss						

Note:

LCS with the same matrix as samples must be prepared for each SDG. 4/21/10 ER

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

	PERCENT RECOVERY			
1. AQUEOUS	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

TECHLAW

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: [illegible] BATCH: PYE040112

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
						None	
						out	

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:
Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No
Serial dilutions were not performed for the following:
COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: D4E040112

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

None

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes No NA

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes No NA

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

to RL units provided

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

COMMENTS Form 10 w/ units provided units < RL ✓

As - has [illegible] of 5 ul with [illegible]

[illegible] using RL of 1 - ok MDL is < ~~0~~ 1.0

Re Ba 0.222 ppm = 220 ppb

Al 0.026 = 26

Fe 27.737 → 28,000

Re Cr Di 68.4 ✓

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DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Bill Fear – TechLaw, Inc.
Report Date: September 8, 2004
Project/Site: VB/I-70 OU3
Laboratory No.: D4G280388

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, and 7470A for Laboratory Lot No. D4G280388 from Severn Trent Laboratories, Inc. This report consists of the validation of four total and five dissolved water samples collected on July 28, 2004 and analyzed on August 4, 6 and 7, 2004 for ICP metals; August 9 and 12, 2004 for ICPMS; and on August 12 and 13, 2004 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
MW-33-072804 (total)	D4G280388-001
MW-33-072804 (dissolved)	D4G280388-001
MW-31-072804 (total)	D4G280388-002
MW-34-072804 (total)	D4G280388-003
MW-34-072804 (dissolved)	D4G280388-003
MW-32-072804 (total) +	D4G280388-004
MW-32-072804 (dissolved) +	D4G280388-004
MW-36-072804 (dissolved)	D4G280388-005
MW-35-072804 (dissolved)	D4G280388-006

+ denotes full validation

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Validated By: Bill Fear Reviewed By: Lisa Tyson

Samples MW-32-072804 (total) and MW-32-072804 (dissolved) were randomly selected for full validation. Cursory validation was conducted on all remaining sample analyses. The data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation
  Calibrations
* Blanks
* Interference Check Samples
* Matrix Spike/Matrix Spike Duplicates
* Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
* Serial Dilution for ICP Analysis
* Analyte Quantitation and Reporting Limits (full validation only)

* **All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficients for mercury were greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery with the exception of a recovery for beryllium (110.8%) in a CCV standard bracketing two total samples. No action was required as beryllium was non-detected in the associated sample analyses.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks with the exception of cobalt in one CCB at 0.0.67 ug/L and for manganese in one CCB at 1.0 ug/L. No action was required as the sample results were non-detected or greater than five times the blank values. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on samples MW-33-072804 (total) and MW-31-072804 (total) and on samples from another SDG.

All MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the un-spiked sample amount was greater than 4 times the spike value and the recoveries were not applicable.

The laboratory was evaluating the spike recoveries against the laboratory QC limits. As a result, the laboratory indicated that a recovery for mercury at 81% was outside the laboratory percent recovery QC limits. No action was taken because the recovery was within 75-125%.

Several calculation discrepancies were noted for the matrix spike recoveries. It appears that the laboratory software was using the found value for the un-spiked sample amount even though the result was reported as non-detected.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD relative percent differences (RPDs) and all RPDS were less than 20%.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses at the correct frequency. All recoveries were within 80-120%. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on samples MW-33-072804 (total) and MW-31-072804 (total) and on samples from another SDG.

All %Ds were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. The results and reporting limits were correctly reported. No calculation or transcription errors were found.

All results were reported within the linear calibration range.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

U J - The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

NR - Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

BATCH: D4G250258

List all analytes which do not meet holding time criteria

Trace ICP

	Sample ID	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	~~*CN Analysis~~ Date	MS Analysis Date/s	No. of Days Past Holding Time	Action
	total									
1	mw-33-072604	H2O	A	7/28/04	8-6-04	8-13-04	8-9-04	8-9-04	-0-	None
2	mw-31-072604	↓	↓	↓	↓	↓	↓	↓		
3	mw-34-072604	↓	↓	↓	↓	↓	↓	↓		
4	mw-32-072604	↓	↓	↓	↓	↓	↓	↓		
5	~~mw-36-072604~~									
									to 8/16	
								8/17	Form I Amendment	
	Dissolved									
1	MW-33			7/28/04	8/7/04	8-12-04	~~8/12/04~~	8-12-04		
3	MW-34			↓	↓	↓	↓	↓		
4	MW-32			↓	↓	↓	↓	↓		
5	MW-36			↓	↓	↓	↓	↓		
6	MW-35			↓	↓	—	↓	↓		
						No Hg	for	MW-35 D		

COMMENTS 3.2°C

Fail DV on MW-32 T&D

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: Billy F. Date:

Review By: L. Tyson Date:

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

***VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.**

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET – ICP CALIBRATIONS

BATCH: D4G220388

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
8/12 Be	CCV7	50	55.4	110.8	None	8/4/04 #1 ICV CCV6, CCV7
					with ND	(7231)
						8/4/04 #2 ICV CCV5, 6
						(7232)
						8/6 ICP ICV CCV3-5
						~~[illegible]~~
						Trace 8/27 ICV 5-6
						8/6/8/7 ICP ICV 5
						8/9 ICPMS ICV 2-4
						8/12 ICPMS

No Actions

CCV run after CRI, every 10 samples and at end of sequences? (CLP only)	Yes	No
Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)?	Yes	No
COMMENTS 8/12 ICPMS - [illegible] 5 Dilution - [illegible]		

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET – Hg CALIBRATIONS

BATCH: D4G200358

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
					— 80-120 [illegible] —
				None	

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.99993 r 0.99937
   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No CRA ✓
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

TECHLAW

III. INORGANIC ANALYSIS WORKSHEET – BLANKS

MATRIX: H2O

BATCH: D4G280738

List the highest positive AND negative blank result >=|DL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
Co	CCB4	5 ug/L	0.67	3.35	—	ND or >5x (37, 32 T)
Mn	CCB5	1.	1.0	5.0	—	
					None	

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify

One prep blank per matrix ✓

One prep blank per batch ✓

ICB analyzed immediately after ICV ✓

CCB analyzed after each CCV.

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

TECHLAW

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: D46280358

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
				#4 TAD
				None > ICSA

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
			All [illegible]
			None out

CLP Protocol Only

Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

TECHLAW

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: H2O BATCH: D46280358

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
#27	ICP-MS						75-125
#17	ICP						75-125
Another SDG	Hg (T)						
Another SDG							
DISS	ICP /	ICP-MS					75-125 & 2ea
		Hg			flagged	Q. SPL	(84-114)
						none	w/in 75-125

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS

NO actions

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: H_2O BATCH: DGU28035R

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
							MS(-11)
							Rows all 2201.
						RPD Out	

COMMENTS

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|
Include outliers for field duplicates (if applicable)

Note

A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX: H_2O BATCH: D4G240208

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
						Total 80-120 ✓
						Diss ✓
					None	

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

1. AQUEOUS	<50%	50-79%	80-120%	>120%
	PERCENT RECOVERY			
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: H2O BATCH: D46280358

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
Ba							all @ RL in
Mn							SD resulting to RL
					None	Out	

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: D4G 280358

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

None.

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

All w/in range

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes No NA

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes No NA To RL

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

COMMENTS

ND @ RL

None

ROUND 3: WATER VALIDATION REPORTS

SDG: *D4K190487*
SDG: *D5C280224*
SDG: *D5E020222*

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DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Lisa Tyson – TechLaw, Inc.
Report Date: June 22, 2004
Project/Site: VB/I-70 OU3
Laboratory No.: D4K190487

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, and 7470A for Laboratory Lot No. D4K190487 from Severn Trent Laboratories, Inc. This report consists of the validation of seven total and dissolved water samples collected on November 19, 2004 and analyzed on November 22 and 23, 2004 and December 1 and 2, 2004 for ICP and ICPMS metals, and on November 30, 2004 and December 2, 2004 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
KP-GW-16-111904 (total and dissolved)	D4K190487-001
KP-GW-15-111904 (total and dissolved)	D4K190487-002
KP-GW-17-111904 (total and dissolved)+	D4K190487-003
MW-31-111904 (total and dissolved)	D4K190487-004
KP-GW-46-111904 (total and dissolved)	D4K190487-005
KP-GW-46-111904A (total and dissolved)	D4K190487-006
MW-30-111904 (total and dissolved)	D4K190487-007

+ denotes full validation

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Validated By: Lisa Tyson

Reviewed By: Bill Fear

Sample KP-GW-17-111904 (total and dissolved) was randomly selected for full validation. Cursory validation was conducted on all remaining sample analyses. The data were evaluated based on the following parameters:

- * Data Completeness
- * Holding Times and Preservation
- Calibrations
- * Blanks
- * Interference Check Samples
- Matrix Spike/Matrix Spike Duplicates
- Duplicate Samples
- * Blank Spikes (Laboratory Control Samples)
- * Serial Dilution for ICP Analysis
- * Analyte Quantitation and Reporting Limits (full validation only)

* **All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficients for mercury were greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery with the exception noted below.

Due to elevated recoveries for beryllium at 110.6% and 114.6% in CCV standards bracketing the total samples, the following detected result was qualified as estimated (J):

- Beryllium in sample MW-30-111904 (Total)

Beryllium was not detected in any other associated samples.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

The aluminum, calcium, iron, and magnesium concentrations in the full validation sample were less than the ICSA values and no action was required.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on sample KP-GW-16-111904 for total and dissolved metals and on a sample from another SDG for total metals.

The following detected sample results were qualified as estimated (J) because the spike recoveries at 410% and 424% exceeded 125% in the MS/MSD analyses performed on a sample from another SDG:

- Total aluminum in samples KP-GW-16-111904 and KP-GW-17-111904

The following sample results were qualified as estimated (J/UJ) because the spike recovery at 39% was below 75%, but greater than 30% in the MS analysis performed on a sample from another SDG:

- Total zinc in all samples

All other MS/MSD percent recoveries were within the technical validation QC limits of 75-125% or the unspiked sample amount was greater than 4 times the spike value and the recoveries were not applicable.

The laboratory evaluated the spike recoveries against laboratory QC limits. As a result, the laboratory indicated that the recoveries for antimony, beryllium, and arsenic were outside QC limits. No action was taken because the recoveries were within validation QC limits of 75-125%.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD relative percent differences (RPDs). Duplicate criteria were met (i.e., for results greater than 5x the reporting limit, RPDs were less than 20% and for results less than 5x the reporting limit, the difference between the duplicate and the original was less than the reporting limit), with the exception identified below.

The following sample results were qualified as estimated (J/UJ) because the duplicate RPD of 41% exceeded 20% in the MS/MSD analyses from a sample in another SDG:

- Total zinc in all samples

No calculation errors or transcription errors were found.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses at the correct frequency. All recoveries were within 80-120%. No calculation errors or transcription errors were found.

Serial Dilution Analysis

All %Ds were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation sample. The results and reporting limits were correctly reported, and all results were reported within the linear calibration range. No calculation or transcription errors were found.

Samples KP-GW-46-111904 and KP-GW-46-111904A for both total and dissolved metals were identified as field duplicates. RPDs were less than 20% or the difference between the duplicate and the original was less than the reporting limit.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

U J - The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

NR - Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

BATCH: 04K190487

List all analytes which do not meet holding time criteria

Sample ID	Matrix	List Preservative (A, B, C)	Date Collected	Tot *Metals Analysis Date/s	Total *Hg CVAA Analysis Date	Dissolved ~~*CN~~ Analysis Date	Dissolved ~~Batch~~ Analysis Date/s	No. of Days Past Holding Time	Action
KP-GW-16-111904	W	A	11/19/07	11/22, 23 12/1, 3	11/30	11/23, 29 12/1	12/4/07	3/4	none
-15-									
-17-									
MW-31-111907									
KP-GW-46-111907									
-111907A									
MW-30-111907									

COMMENTS 5.3°C

111907 & 111907A → 2 days

* Extra vial on KP-GW-17-111907

~~Actions:~~

~~1. If~~ holding times are exceeded, all sample results are estimated (J)/(UJ).

2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: L. Tyson Date:

Review By: [signature] Date:

Presenratives:

~~A. Preserved w/~~HNO3 and cooled to 4°C

B. Cooled to 4°C

C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C
Holding Time = Analysis Date - Collection Date			

*VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET – ICP CALIBRATIONS

BATCH: 04K190487

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
Total:						
Criteria Met, w/ following exception						
2115(1/1) Be	CCV(4)	50.00	55.30	110.6	J	detects in all (6020)
2149(1/1) Be	CCV(6)	50.00	57.29	114.6		
						only detect is in
						MW-30-111904 → 2.2 J
Dissolved:						
Criteria Met						

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS CRI ok

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: 04K190487

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
Total -					
Criteria	met				
Dissolved -					
Criteria	met				

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.99984 / 0.99999
   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

TECHLAW

III. INORGANIC ANALYSIS WORKSHEET – BLANKS

MATRIX: GW BATCH: D4K190487

List the highest positive AND negative blank result >=|DL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
Total: PBs & CCBs ND below RL ✓						
Dissolved: PBs & CCBs ND below RL ✓						

~~NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL~~

~~Verify~~

~~One prep blank per matrix~~

~~One prep blank per batch~~

~~ICB analyzed immediately after ICV~~

~~CCB analyzed after each CCV.~~

~~Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.~~

~~COMMENTS~~

~~Actions:~~

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

IVA. INORGANIC ANALYSIS WORKSHEET – ICP INTERFERENCE CHECK SAMPLE

BATCH: 04K190187

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
Total				
None				
Dissolved				
None				

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
Total			
Criteria met			
Dissolved			
Criteria met			

CLP Protocol Only

Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

TECHLAW

V. INORGANIC ANALYSIS WORKSHEET – PRE-DIGESTION MATRIX SPIKE

MATRIX: W BATCH: D4K190187

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
Total	– KP-GW-16-111904			– Used	75-125	lab	used limits
	ms/msD						
	Criteria met						
	– lab generated ms/msD				#4327595		
ms	Al	13800	5600	2000	410	J	detects
msD		14100	5600	2000	424		
ms	Zn	552	390	500	39	J/UJ	all # 4327595 batch
	– KP-GW-46-111904						
	Sb	44.6	ND	40	111/110		lab indicated out, but
	Be	48	ND	40	120/125		w/in val limits - no Qual
	As				--/110		
Dissolved	– KP-GW-16-111904 ms/msD						
	Criteria met						

1. ~~Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is~~ more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes ~~No NA~~ A-spike for 6020 only

3. ~~Was a matrix spike prepared for each different sample matrix?~~ Yes ~~No~~

~~COMMENTS~~

16, 46, 31, 131, 30

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

~~If an~~alyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET – LABORATORY DUPLICATES

MATRIX: W

BATCH: 0946198487

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
Total -	RPD	16-111904		ms/msD		→ RPD	
	- Lab ms/msD						
	Zn	382	850	41		J/UJ	#11, 9327595
	C296-20						
Dissolved	-	ms/msD					
	Criteria	Met					

COMMENTS

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > ~~CRDL~~, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|
Include outliers for field duplicates (if applicable)
Note
A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

VII. INORGANIC ANALYSIS WORKSHEET – LABORATORY CONTROL SAMPLES

MATRIX: W BATCH: D4L190187

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
Tota	- used	80-120;	lab	used wrong		
	Criteria Met					
Dissolved						
	Criteria Met					

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

	PERCENT RECOVERY			
1. AQUEOUS	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

IX. INORGANIC ANALYSIS WORKSHEET – ICP SERIAL DILUTION ANALYSIS

MATRIX: W BATCH: 04W190187

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
Total	- Criteria	Met					
Dissolved	- Criteria	Met					

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

~~Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within~~ ten percent of the original undiluted analysis. Yes No

~~Serial dilutions were not performed for the following:~~

COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

~~If results~~ from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: 04W190187

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

None

2. List results that fall outside ~~the linear range of the ICP instrument or the~~ calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

None (all) except KP-GW-17-111904
Mn - [illegible] 465
Raw data "H" [illegible] Equal 2 linear range - ok

3. Were ICP linear ranges ~~obtained within 3 months of, and~~ preceding, the sample analyses? **Yes** No NA

4. Were ICP interelement corrections ~~obtained within 12 months of, and~~ preceding, the sample analyses? **Yes** No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, ~~and~~ obtained within 3 months of, and preceding, the sample analyses? Yes No **NA**

6. ~~Were all sample results reported down to the IDL if running CLP protocol?~~ Yes No **NA**

7. ~~Were all sample results reported down to MDL if running SW-846 methods?~~ Yes **No** - RL NA

8. ~~Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results?~~ **Yes** No

~~COMMENTS~~

Full on KP-GW-17-111904 ~~[illegible]~~ [illegible] 6/17/05

Total				Dissolved			
KP-GW-46-111904	A-111904A		Dups				
Ca	200,000	190,000	5	Ca	190,000	190,000	0
Mg	30,000	29,000	3	Mg	29,000	29,000	0
K	6,700	6,700	0	K	6,400	6,500	2
Na	250,000	250,000	0	Na	240,000	240,000	0
Ba	80	78	3	Zn	180	180	0
Mn	11	11	0	Ba	77	77	0
Zn	170	160	6	Cd	24	24	0
Cd	24	23	4	Mn	ND	12	200

RL=10
50 0.5 < RL OK

INORG98.XLS

DATA VALIDATION REPORT

To:	Jennifer Walter – Syracuse Research Corporation
From:	Lisa Tyson – TechLaw, Inc.
Report Date:	June 22, 2004
Project/Site:	VB/I-70 OU3
Laboratory No.:	D5C280224

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, and 7470A for Laboratory Lot No. D5C280224 from Severn Trent Laboratories, Inc. This report consists of the validation of two total and dissolved water samples collected on March 28, 2005 and analyzed on March 30 and 31, 2005 for ICP and ICPMS metals, and on March 29, 2005 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
KP-SW-1-032805 (total and dissolved)	D5C280224-001
KP-SW-2-032805 (total and dissolved) +	D5C280224-002

+ denotes full validation

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Sample KP-SW-2-032805 (total and dissolved) was randomly selected for full validation. Cursory validation was conducted on the other sample analysis. The data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation
* Calibrations
* Blanks
* Interference Check Samples
* Matrix Spike/Matrix Spike Duplicates
* Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
* Serial Dilution for ICP Analysis
* Analyte Quantitation and Reporting Limits (full validation only)

* **All criteria were met for this parameter**

Validated By: Lisa Tyson

Reviewed By: Bill Fear

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory at ambient temperatures outside the recommended temperature range of 4 ± 2°C. However, the samples were delivered to the laboratory immediately after sampling. No qualification was necessary. No other shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficients for mercury were greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110%.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%.

The aluminum, calcium, iron, and magnesium concentrations in the full validation sample were less than the ICSA values and no action was required.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on sample KP-SW-1-032805 for total and dissolved metals. The percent recoveries were within the technical validation QC limits of 75-125% or the unspiked sample amount was greater than 4 times the spike value and the recoveries were not applicable.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD relative percent differences (RPDs). Duplicate criteria were met (i.e., for results greater than 5x the reporting limit, RPDs were less than 20% and for results less than 5x the reporting limit, the difference between the duplicate and the original was less than the reporting limit). No calculation errors or transcription errors were found.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses at the correct frequency. All recoveries were within 80-120%. No calculation errors or transcription errors were found.

Serial Dilution Analysis

All %Ds were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation sample. The results and reporting limits were correctly reported, and all results were reported within the linear calibration range. No calculation or transcription errors were found.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R	-	Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
J	-	The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
U J	-	The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.
U	-	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
NR	-	Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET – HOLDING TIMES

BATCH: 05C280224

List all analytes which do not meet holding time criteria

Sample ID	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	*CN Analysis Date	Analysis Date/s	No. of Days Past Holding Time	Action
KD-SW-1-032805	w	HNO3	3/28/05	3/31/05	3/29/05			0	none
* KD-SW-2-032805	✓	✓	✓	✓	✓			✓	✓

COMMENTS Samples delivered immediately after sampling @ each site - same day

* Filtered KDSW-2-032805 only

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: L. Tyson Date:

Review By: [signature] Date:

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C

B. Cooled to 4°C

C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C
Holding Time = Analysis Date - Collection Date			

***VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.**

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET – ICP CALIBRATIONS

BATCH: 05C28224

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
Criteria	Met					

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS: CRI ok

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY <75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: 05C280229

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
Criteria met					

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.99999
   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

TECHLAW

III. INORGANIC ANALYSIS WORKSHEET – BLANKS

MATRIX: w

BATCH: 05C280227

List the highest positive AND negative blank result >=|DL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
PBs & CCBs	ND	below	RL			

~~NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL~~

~~Verify~~

~~One prep blank per matrix~~

~~One prep blank per batch~~

~~ICB analyzed immediately after ICV~~

~~CCB analyzed after each CCV.~~

~~Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.~~

~~COMMENTS~~

~~Actions:~~

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

IVA. INORGANIC ANALYSIS WORKSHEET – ICP INTERFERENCE CHECK SAMPLE

BATCH: DSC-280227

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
null				

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
Criteria Met			

~~CLP Protocol Only~~

Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

~~COMMENTS~~

~~Actions:~~

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

TECHLAW

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: W   BATCH: 05C280227

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
Used 75-125 - Lab Std Limits							
Criteria Met							
KP-SW-1-032805							

~~1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is~~ more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA — Post for ICP/MS

~~3. Was a matrix spike prepared for each different sample matrix? Yes No~~

~~COMMENTS~~

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

~~If~~ ~~an~~alyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET -- LABORATORY DUPLICATES

MATRIX: W BATCH: 05C280221

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
used MS/MSD	- RPDs ok						

COMMENTS

Actions:

1. AQUEOUS

If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.

If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID

If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.

If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|

Include outliers for field duplicates (if applicable)

Note

A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

VII. INORGANIC ANALYSIS WORKSHEET – LABORATORY CONTROL SAMPLES

MATRIX: W   BATCH: 05G80224

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
Used	80-120 -	lab used	limits]			
LCS/LCSD -	Hg					
Criteria	Met					

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

	PERCENT RECOVERY			
1. AQUEOUS	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

IX. INORGANIC ANALYSIS WORKSHEET – ICP SERIAL DILUTION ANALYSIS

MATRIX: water BATCH: 05C2802.24

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
Criteria		Met					

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

~~Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within~~ ten percent of the original undiluted analysis. Yes No

~~Serial dilutions were not performed for the following:~~

COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

~~results~~ lts from diluted samples are higher than concentrated sample, matrix interference should be suspected nd sample results may be biased low.

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: 05C280227

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

None

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

None

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes No NA

4. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes No NA

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No RL NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

COMMENTS

Full on NP-SW-2-032805 Only

DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Lisa Tyson – TechLaw, Inc.
Report Date: June 22, 2004
Project/Site: VB/I-70 OU3
Laboratory No.: D5E020222

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metal results by Methods 6010B, 6020, and 7470A for Laboratory Lot No. D5E020222 from Severn Trent Laboratories, Inc. This report consists of the validation of eight total and dissolved water samples collected on May 2, 2005 and analyzed on May 6-10, 2005 for ICP and ICPMS metals, and on May 9, 2005 for mercury. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
PS-7-050205 (total and dissolved) +	D5E020222-001
PS-6-050205 (total and dissolved)	D5E020222-002
PS-5-050205 (total and dissolved)	D5E020222-003
MW-31-050205 (total and dissolved)	D5E020222-004
MW-30-050205 (total and dissolved)	D5E020222-005
PS-3-050205 (total and dissolved)	D5E020222-006
PS-4-050205 (total and dissolved)	D5E020222-007
PS-1-050205 (total and dissolved)	D5E020222-008

+ denotes full validation

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Validated By: Lisa Tyson

Reviewed By: Bill Fear

Sample PS-7-050205 (total and dissolved) was randomly selected for full validation. Cursory validation was conducted on all remaining sample analyses. The data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation
* Calibrations
* Blanks
* Interference Check Samples
  Matrix Spike/Matrix Spike Duplicates
* Duplicate Samples
* Blank Spikes (Laboratory Control Samples)
  Serial Dilution for ICP Analysis
* Analyte Quantitation and Reporting Limits (full validation only)

*** All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory at ambient temperatures outside the recommended temperature range of 4 ± 2°C. However, the samples were delivered to the laboratory immediately after sampling. No qualification was necessary. No other shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficients for mercury were greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110%.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%. No ICP interference was noted.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on sample PS-1-050205 for total and dissolved metals. The percent recoveries were within the technical validation QC limits of 75-125% or the unspiked sample amount was greater than 4 times the spike value and the recoveries were not applicable, with the exceptions noted below.

The following detected sample results were qualified as estimated (J) and the nondetected sample results were qualified as rejected (R) because the spike recoveries at 22% and 20% were below 30%:

- Total antimony in all samples

The following sample results were qualified as estimated (J/UJ) because the spike recoveries at 73% land 74% were below 75%, but greater than 30%:

- Total beryllium in all samples

The laboratory evaluated the spike recoveries against laboratory QC limits. As a result, the laboratory indicated that the recoveries for arsenic were outside QC limits. No action was taken because the recoveries were within validation QC limits of 75-125%.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD relative percent differences (RPDs). Duplicate criteria were met (i.e., for results greater than 5x the reporting limit, RPDs were less than 20% and for results less than 5x the reporting limit, the difference between the duplicate and the original was less than the reporting limit). No calculation errors or transcription errors were found.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses at the correct frequency. All recoveries were within 80-120%. No calculation errors or transcription errors were found.

Serial Dilution Analysis

The laboratory performed the serial dilution analysis on samples PS-1-050205. The following detected sample results were qualified as estimated (J) because the serial dilution %D exceeded 10% for analyte concentrations greater than 50 times the MDLs:

- Total arsenic and beryllium in all samples

All other %Ds were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation sample. The results and reporting limits were correctly reported, and all results were reported within the linear calibration range. No calculation or transcription errors were found.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R	-	Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
J	-	The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
U J	-	The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.
U	-	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
NR	-	Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

TECHLAW

I. INORGANIC ANALYSIS WORKSHEET – HOLDING TIMES

BATCH: QEC020222

List all analytes which do not meet holding time criteria Total Dissolved

Total & Dissolved Sample ID	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	*CN Analysis Date	Analysis Date/s	No. of Days Past Holding Time	Action
PS-7-050205	W	HNO3	5/5/05	5/6-10/05	5/9/05	5/6-10/05		0	
-6									
-5									None
MW-31-									
-30-									
PS-3-									
-4									
-1-									

Per case narrative – Received @ ambient temp. Comment
Hand delivered to lab by client immediately after sampling event

COMMENTS Full on PS-7-050205 (Al, Ca, Fe, Mg, K, Na, Zn) (Ba, Cr, Co, Cu, Pb, Mn, Ni, Se, Ag, V) 6010
Cursory on all Sb, As, Be, Cd, Tl 6020

Actions:
1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: L. Tyson Date:

Review By: [signature] Date:

Preservatives:
A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C
Holding Time = Analysis Date - Collection Date			

*VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET – ICP CALIBRATIONS

BATCH: 05E020222

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
Criteria Met						
(total & dissolved) ✓						

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No

Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No

COMMENTS CRI ok ✓

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET – Hg CALIBRATIONS

BATCH: 05E020222

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected
Criteria	Met				

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No 0.99997
   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

TECHLAW

III. INORGANIC ANALYSIS WORKSHEET – BLANKS

MATRIX: W

BATCH: 05E0207-2

List the highest positive AND negative blank result >=|DL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
Pb →	ND's	✓	All below RL		(0.2-4	report b/w MDL and RL) X
CCBs →	ND's	✓	All below RL		(0.2-4	report b/w MDL and RL) X

~~NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *~~

~~Verify~~

~~One prep blank per matrix~~

~~One prep blank per batch~~

~~ICB analyzed immediately after ICV~~

~~CCB analyzed after each CCV.~~

~~Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.~~

~~COMMENTS~~

~~Actions:~~

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).
* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

IVA. INORGANIC ANALYSIS WORKSHEET – ICP INTERFERENCE CHECK SAMPLE

BATCH: 05E0202

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
PS-7-050205D	Ca	640,000	500,000	
T	CA1	630,000	500,000	
PS-3-050205T	Fe (5x)	510,000	500,000	ok @ 5x

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected
Criteria Met			

~~CLP Protocol Only~~

Were Interference Check Samples run at the beginning ~~and end~~ of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

no end, not req'd

~~COMMENTS~~

~~Actions:~~

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

TECHLAW

IVB. INORGANIC ANALYSIS WORKSHEET – ICP INTERFERENCE CHECK SAMPLE

BATCH: 05E02027

Note: For the CLP protocol only, report the concentration of any analytes detected in the ICSA solution > |IDL | that should not be present (apply only to samples with elements identified at concentrations above the ICSA on the previous page).

DL	Analyte	ICSA Result	Action	Sample/ Result	Sample/ Result	Sample/ Result T	Sample/ Result D	Sample/ Result	Sample/ Result
100	Na	-1542.8	J-ICSA (?)	05-7 T	D	610,000	1,560,000		Na
-50	K	-179				25,000	8,500		9 well
1,9	Zn	-14.2				4,800	660 (?)		> 5x

Actions:

If the ICSA value > the positive IDL:

1. For non-detected results, no action is taken.
2. Estimate (J) all detected results < = 5*ICSA.

If the ICSA value < -IDL:

1. Estimate (J) detected results < = 5* |ICSA|.
2. Estimate (UJ) non-detected results.

V. INORGANIC ANALYSIS WORKSHEET – PRE-DIGESTION MATRIX SPIKE

MATRIX: W BATCH: ASE0202?

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
Total	Metals:	MS/MSD					
Total	Hg						
PS-1-050205	– Criteria Met			(used 75-125		– lab used 2.6. limits)	
		For 6010		(No 2.F			
~~6020~~							
	Sb	9.18	U	40	22	(J/R	total)
MS	As	60.1	28	40	80	– outside lab but w/in val – OK	
	Be	33.0	4.4	40	73	(J/UJ	total)
MSD	Sb	8.3	U	40	20	(see	above)
	As	60.4	28	40	81	– outside lab w/in validation – OK	
	Be	33.9	4.4	40	74	(see	above)
Dissolved Metals: MS/MSD							
Dissolved Hg							
PS-1-050205							
– Criteria Met							

~~1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)?~~ Yes No

~~2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria?~~ Yes No NA MSD & Post (Total) Post Digestion – 70.4 no qual

~~3. Was a matrix spike prepared for each different sample matrix?~~ Yes No

~~COMMENTS~~

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

PERCENT RECOVERY

	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

~~If~~ analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET – LABORATORY DUPLICATES

MATRIX: w   BATCH: 05E02022

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
Used	ms/msD –	RPD	criteria		Met		

COMMENTS

Actions:

1. AQUEOUS
If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID
If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.
If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|
Include outliers for field duplicates (if applicable)

Note

A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

TECHLAW

VII. INORGANIC ANALYSIS WORKSHEET – LABORATORY CONTROL SAMPLES

MATRIX: W BATCH: 05E070272

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R	Action	Samples Affected
Used	80-120 to validate			– lab	used	various limits
LCS/LCSD for Hg						
Criteria Met						

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

	PERCENT RECOVERY			
1. AQUEOUS	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS

Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

TECHLAW

IX. INORGANIC ANALYSIS WORKSHEET – ICP SERIAL DILUTION ANALYSIS

MATRIX: W BATCH: 05E020222

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	MIDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
As	0.094	4.7	28.15	32.02	13.7	J	Totals
Be	0.061	3.05	4.39	5.58	27.1		
PS-1-050203							
				Batch 5124644			

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

~~Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within~~ ten percent of the original undiluted analysis. Yes No

~~Serial dilutions were not performed for the following:~~

COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

~~If results~~ from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: DSE020222

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

none

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

none

3. Were ICP linear ranges ~~obtained within 3 months of, and preceding~~, the sample analyses? Yes No NA

4. Were ICP interelement corrections ~~obtained within 12 months of, and preceding~~, the sample analyses? Yes No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, ~~and~~ obtained within 3 months of, and preceding, the sample analyses? Yes No NA

6. ~~Were all sample results reported down to the IDL if running CLP protocol?~~ Yes No NA

7. ~~Were all sample results reported down to MDL if running SW-846 methods?~~ Yes No RL NA

8. ~~Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results?~~ Yes No

~~COMMENTS~~

Full on DS-7-050205 only

IS okay

INORG98.XLS

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ROUND 4: WATER VALIDATION REPORTS

SDG: D5I19220

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DATA VALIDATION REPORT

To: Jennifer Walter – Syracuse Research Corporation
From: Lisa Tyson – TechLaw, Inc.
Report Date: October 26, 2005
Project/Site: VB/I-70 OU3
Laboratory No.: D5I190220

This memo presents the metals data validation report for the data obtained during the field activities for the above referenced work assignment. The purpose of this review is to provide a technical validation of the metals results by Methods 6010B, 6020, and 7470A for Laboratory Lot No. D5I190220 from Severn Trent Laboratories, Inc. This report consists of the validation of 12 total and 9 dissolved water samples collected on September 19 and 20, 2005. The field sample numbers and corresponding laboratory numbers are presented below:

Field Sample Number	Laboratory Sample Number
KP-PS-19-091905 (total and dissolved)	D5I190220-001
KP-PS-18-091905 (total and dissolved) +	D5I190220-002
KP-PS-17-091905 (total and dissolved)	D5I190220-003
MW-31-091905 (total)	D5I190220-004
KP-PS-16-091905 (total and dissolved)	D5I190220-005
KP-PS-15-091905 (total and dissolved)	D5I190220-006
KP-PS-14-092005 (total and dissolved) +	D5I190220-007
KP-PS-13-092005 (total and dissolved)	D5I190220-008
MW-30-092005 (total)	D5I190220-009
KP-PS-12-092005 (total and dissolved)	D5I190220-010
KP-PS-11-092005 (total and dissolved)	D5I190220-011
KP-PS-11-092005A (total)	D5I190220-012

+ denotes full validation

Data validation was conducted in accordance with the documents "Test Methods for Evaluating Solid Wastes, SW-846, 3rd Edition," (Third update 1996), and the USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses, February 1994.

Samples KP-PS-18-091905 (total and dissolved) and KP-PS-14-092005 (total and dissolved) were randomly selected for full validation. Cursory validation was conducted on all remaining sample analyses.

Validated By: Lisa Tyson

Reviewed By: Bill Fear for Bill Fear

The data were evaluated based on the following parameters:

- * Data Completeness
- * Holding Times and Preservation
- Calibrations
- * Blanks
- * Interference Check Samples
- Matrix Spike/Matrix Spike Duplicates
- * Duplicate Samples
- * Blank Spikes (Laboratory Control Samples)
- * Serial Dilution for ICP Analysis
- * Field Duplicates
- * Analyte Quantitation and Reporting Limits (full validation only)

* **All criteria were met for this parameter**

Data Completeness

All data necessary to complete data validation were provided.

Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Mercury was analyzed within the required 28 days of sample collection and all other metals were analyzed within 180 days of collection.

The samples were received at the laboratory within the recommended temperature range of 4 ± 2°C at 5.7°C. No shipping or receiving problems were noted. Chain-of-custody and summary forms were evaluated.

Calibrations

The instruments were calibrated at the required frequency. Continuing calibrations were analyzed every ten samples. The correlation coefficients for mercury were greater than 0.995. No calculation errors were found.

Initial Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110% recovery.

Continuing Calibration Verification

The percent recoveries of mercury were within the 80-120% criteria. All other analytes were within the required 90-110%, with the exceptions noted below.

The recoveries for beryllium in CCV7 and CCV9 (114% and 111.8%) and thallium in CCV8 and CCV9 (111% and 111.4%) were greater than 110%. However, no qualification was necessary because detected results for these analytes were not reported in the associated dissolved samples.

Blanks

The method blanks and calibration blanks were analyzed at the required frequency. Contamination was not reported in the method or calibration blanks. All non-detected results were reported to the reporting limits. Detected results were not reported below the reporting limits.

Interference Check Samples

All interference check sample percent recoveries were within 80-120%. No ICP interference was noted.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on sample KP-PS-18-091905 for total and dissolved metals and mercury. MS/MSD analyses from a sample in another SDG were also provided for mercury. The percent recoveries were within the technical validation QC limits of 75-125% or the unspiked sample amount was greater than 4 times the spike value and the recoveries were not applicable, with the exceptions noted below.

The following nondetected sample results were qualified as rejected (R) because the MSD spike recovery (QC batch 5265522) at 28% was below 30% (the MS spike recovery was also low at 32% and detected results for mercury were not reported in the associated samples):

- Mercury (total) in samples KP-PS-14-092005, KP-PS-13-092005, KP-PS-12-092005, KP-PS-11-092005, KP-PS-11-092005A, and MW-30-092005

The following sample results were qualified as estimated (J/UJ) because the MS/MSD spike recoveries (QC batch 5265193) of 52% and 44% were below 75%, but greater than 30%:

- Antimony (total) in all samples

The laboratory evaluated the spike recoveries against laboratory QC limits. As a result, the laboratory indicated that the recovery for beryllium at 83% as outside QC limits. No action was taken because the recovery was within validation QC limits of 75-125%.

Duplicate Sample Analysis

Duplicate precision criteria were evaluated using the MS/MSD relative percent differences (RPDs). Duplicate criteria were met (i.e., for results greater than 5x the reporting limit, RPDs were less than 20% and for results less than 5x the reporting limit, the difference between the duplicate and the original was less than the reporting limit). No calculation errors or transcription errors were found.

The laboratory evaluated the RPDs against laboratory QC limits. As a result, the laboratory indicated that the RPD for mercury at 11% as outside QC limits. No action was taken because the RPD was within validation QC limits of less than 20%.

Laboratory Control Samples

The laboratory performed laboratory control sample analyses at the correct frequency. All recoveries were within 80-120%. No calculation errors or transcription errors were found.

The laboratory evaluated the recoveries against laboratory QC limits. As a result, the laboratory indicated that the recovery for copper at 113% as outside QC limits. No action was taken because the recovery was within validation QC limits of 80-120%.

Serial Dilution Analysis

The serial dilution %Ds were less than 10% or the sample result was less than 50 times the MDL. No calculation errors or transcription errors were found.

Field Duplicates

Samples KP-PS-11-092005 (total) and KP-PS-11-092005A (total) were identified as field duplicates. The RPDs were less than 25% for analytes detected above the reporting limits (RPDs ranged from 0% to 19%).

Analyte Quantitation and Reporting Limits (Full Validation Only)

Analyte quantitation and reporting limits were evaluated for the full validation samples. The results and reporting limits were correctly reported, and all results were reported within the linear calibration range. No calculation or transcription errors were found.

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality.

R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

U J - The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

NR - Result was not used from a particular sample analysis. This typically occurs when more than one result for an element is reported due to dilutions and reanalyses.

I. INORGANIC ANALYSIS WORKSHEET -- HOLDING TIMES

BATCH: 0SI190220

List all analytes which do not meet holding time criteria   Total TAO Dissolved

Sample ID	Matrix	List Pre-servative (A, B, C)	Date Collected	*Metals Analysis Date/s	*Hg CVAA Analysis Date	~~*CN~~ metals Analysis Date	Analysis Date/s	No. of Days Past Holding Time	Action
HP-PS-19-091905	W	A	9/19	9/18-29	9/23,26	9/18-27			
* -18									
-17								0	
MW-31-091905						NA			
HP-PS-16-091905						9/21-27			
15									
* 14-092005			9/20						
13									
MW-30-092005						NA			
HP-PS-12-092005						9/26-27			
Dup -11									
-11-092005A						NA			

COMMENTS 5.7°C

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded (>=2*holding time), detected results are estimated (J), and non-detected results are rejected (R).

Validated by: L. Tyson   Date:

Review By: B. McF   Date:

Preservatives:

A. Preserved w/HNO3 and cooled to 4°C
B. Cooled to 4°C
C. No Preservative

ANALYTE	HOLDING TIME	PRESERVATIVE AQUEOUS	SOIL
Metals	180 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Mercury	28 days	pH < 2 w/HNO3, 4 Deg. C	4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C	4 Deg. C

Holding Time = Analysis Date - Collection Date

*VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.

TECHLAW

IIA. INORGANIC ANALYSIS WORKSHEET -- ICP CALIBRATIONS

BATCH: 190220

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Analyte	ICV CCV	TRUE	Found	% R	Action	Samples Affected
Be	CCV7		/	114		19,18
	CCV9			111.8		17,16,13,19,15,12,11
Tl	CCV8			117		17,16,15,17,13,12,11
	CCV9			111.7		
						Need J - ND on dissolved samples

CCV run after CRI, every 10 samples and at end of sequences? (CLP only) Yes No	
Was a CRDL check sample (CRI) analyzed at the beginning and at the end of each sample run (CLP only)? Yes No	
COMMENTS	

Actions:

ICV/CCV Actions:

Dissolved { CCV7 19,18; CCV8 17,16,15,17,13,12,11; CCV9

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V.

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

TECHLAW

IIC. INORGANIC ANALYSIS WORKSHEET -- Hg CALIBRATIONS

BATCH: 190770

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

ICV CCV	TRUE	Found	% R	Action	Samples Affected

1. Were the correct number of standards and blanks used to calibrate the instrument? Yes No
2. Is the initial calibration correlation coefficient > 0.995? Yes No
   If no, list affected analytes and samples:
3. Was a CRDL check sample (CRA) analyzed at the beginning of each sample run? (CLP only) Yes No
4. CCV run after CRA, every ten samples and at end of sequence? Yes No

COMMENTS

Actions:

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).
2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

TECHLAW

III. INORGANIC ANALYSIS WORKSHEET – BLANKS

MATRIX: W BATCH: 19020

List the highest positive AND negative blank result >=|IDL| below. Use one worksheet for soil matrix and another for water matrix.

Analyte	ICB CCB PB/MB	IDL	Blank Conc.	5 * Bl. Conc.	Action	Samples Affected
PBs	< MDL					
CCBs	< CRDL					
		No qual				

NOTE: Verify that the absolute value of any analyte concentration in the PB or MB is < CRDL *

Verify

One prep blank per matrix

One prep blank per batch

ICB analyzed immediately after ICV

CCB analyzed after each CCV.

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

Actions:

1. If |Blank| < IDL, no action is taken.
2. If Blank > = IDL, then all sample results > = IDL and < 5*Blank are non-detected (U).
3. If Blank = < -IDL, all sample results > = IDL and < 5* |Blank| are estimated (J).
4. If Blank = < -IDL then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

IVA. INORGANIC ANALYSIS WORKSHEET -- ICP INTERFERENCE CHECK SAMPLE

BATCH: 190220

NOTE: The sample results can be accepted without qualification, if the sample concentrations of Al, Ca, Fe and Mg are less than or equal to the concentration found in the ICSA solution.

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

Sample ID	Analyte	Sample Result	ICS Value	Comments
none				

List any analytes in the ICS AB solution that did not meet the criteria of 80-120% R.

Analyte	% R	Action	Samples Affected

CLP Protocol Only
Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: W BATCH: 190220

List all parameters that do not meet the ~~percent recovery~~ criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

Sample ID	Analyte	Spiked Sample Result	Sample Results	Spike Added	% R	Action	Samples Affected
18(Total)		——	MS/MSD				
	Al	74x		(QC Batch S265237)			
	Fe	74x	[illegible]				
	Mn	74x					
							(Total)
Hg	(another QC for		Batch	526552			14, 13, 50, 12, 11, 11A
	Hg	1.58	ND	5	32	J/R	
					28		
							< 30 J/R
18(Total)							
	QC Batch	5265193					
	Sb	21.3	ND	40	52/44	J/UJ	All Total
	Be	- inadvertently	cut by lab		@ 83	(86-115)	but w/in val. limits
18(Dissolved)		QC 5265492					
	Mn	74x					

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? Yes No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? Yes No NA

3. Was a matrix spike prepared for each different sample matrix? Yes No

COMMENTS

Post ok for Sb

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

	PERCENT RECOVERY			
	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

TECHLAW

VI. INORGANIC ANALYSIS WORKSHEET – LABORATORY DUPLICATES

MATRIX: W BATCH: 190220

List all parameters that do not meet RPD or CRDL criteria.

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference[3]	Action	Samples Affected
Hg	(QC Batch 526552x)						
	Lab duplicate	RPD out @ .11	(<10x lab)				, but within the
	Validation -	no qual.					
MS/	MSD + RPDs	ok					

COMMENTS

Actions:

1. AQUEOUS

*If both sample values > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 20%.*

If either sample value < 5*CRDL, and the difference between the duplicate and the original is > CRDL, estimate (J)/(UJ) all sample results of the same

2. SOLID

If both sample value > 5*CRDL, estimate (J/UJ) all sample results of the same matrix if the RPD is > 35%.

If either sample value < 5*CRDL, and the difference between the duplicate and the original is > 2*CRDL, estimate (J)/(UJ) all sample results of the

Difference = |Sample result - Duplicate sample result|

Include outliers for field duplicates (if applicable)

Note

A duplicate sample must be prepared for each sample matrix analyzed or per batch, whichever is more frequent.

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX: W BATCH: 190210

List all parameters that do not meet the percent recovery criteria.

LCS ID	Analyte	True Value	Found Value	% R .	Action	Samples Affected
Hg	LCS/LCSD					
					(86-110)	
LCS -	Cu	Flagged at	cite @	113%	for batch	5265952,
	but w/in	Hg	val	limits	Comment	w/o qual

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

	PERCENT RECOVERY			
1. AQUEOUS	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

2. SOLID LCS
Recoveries stipulated by EMSL

	BELOW CONTROL LIMITS	WITHIN CONTROL LIMITS	ABOVE CONTROL LIMITS
Detected results	J	V	J
Non-detected results	UJ	V	V

IX. INORGANIC ANALYSIS WORKSHEET -- ICP SERIAL DILUTION ANALYSIS

MATRIX: W BATCH: 190220

Serial dilution criteria only applies if the original sample result is at least 50* IDL and %D > 10%.

Analyte	IDL	50*IDL	Sample Results	Serial Dilution Result	% D	Action	Samples Affected
[illegible]		[illegible]					

INDUCTIVELY COUPLED PLASMA SERIAL DILUTION ANALYSIS:

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis. Yes No

Serial dilutions were not performed for the following:

COMMENTS

Actions:

Estimate (J) detected results if %D is > 10%.

NOTES

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

TECHLAW

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: 190280

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.

none

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

none

3. Were ICP linear ranges ob~~tained within 3 months of, and~~ preceding, the sample analyses? Yes No NA

4. Were ICP interelement corrections ~~obtained within 12 months of, and~~ preceding, the sample analyses? Yes No NA

5. Were instrument detection limits present, found to be less than or equal to the CRDL, ~~and obtained within 3 months of~~, and preceding, the sample analyses? Yes No NA

6. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA

7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

COMMENTS Field Dups RPD

Total	11	11A	RPD	Dissolved	11	11A
Al	8,200	9,900	19	Al	500	
Ca	160,000	150,000	6	Ca	170,000	
Fe	12,000	13,000	8	Fe	850	N/A
Mg	35,000	34,000	3	Mg	34,000	
K	22,000	23,000	4	K	21,000	
Na	240,000	240,000	0	Na	250,000	
Ba	230	250	8	Ba	150	
Cr	12	13	8	Co	12	
Co	13	13	0	Mn	360	
Cu	16	18	12	Zn	27	
Pb	19	19	0			
Mn	440	460	4			
V	16	18	12			
Zn	90	91	1			
As	2.8	3.2	13			

APPENDIX E

EVALUATION OF PHASE I QUALITY CONTROL SAMPLES

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TABLE OF CONTENTS

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E0. OVERVIEW

The quality of environmental data collected during the Phase I field investigation were assessed through the use of quality control (QC) samples analyzed on a regular basis. The objectives and results for field and laboratory QC samples are described below.

E1. FIELD QC SAMPLES

Four different types of field QC samples were collected for soil and groundwater during the Phase I investigation, including field splits, field blanks, equipment blank (rinsate), and performance evaluation (PE) standards. The required frequency, acceptance criteria and evaluation of the results for each field QC sample are briefly described below and are summarized in Table E-1.

E1.1 Field Splits

Field split samples are two aliquots of the same sample that are prepared after the original sample has been homogenized. The samples are submitted to the laboratory blindly at a frequency of approximately 5% of all field samples to evaluate the precision of laboratory analyses. As specified in by the project plan (USEPA 2003), the acceptance criterion for field split samples is a Relative Percent Difference (RPD) for the sample pair (parent sample vs split sample) of 25% or less, or alternatively, an absolute difference (parent sample vs split sample) that does not exceed the method detection limit (MDL), whichever criteria is the least stringent. For the Phase I data collected at the site, the RPD acceptance criteria is the least stringent criteria and was used to evaluate all field split samples collected during the investigation. The RPD is calculated using the following equation:

$$RPD(\%) = \frac{|Parent\ Sample - Field\ Split|}{(Parent\ Sample + Field\ Split)/2} \times 100$$

Detailed RPD calculations for each pair of field split samples collected for soil are presented in

Table E-2, and the data quality findings are summarized in Table E-1. As shown in Table E-1, field split samples were collected from site soils at the required frequency (5%) and meet the required criteria (RPD ≤25%) for each chemical analyzed. Thus, the precision of metals analysis in soil is adequate.

Field split samples were not collected for groundwater during Round 1 due to the total number of groundwater samples collected (2 field samples) or during Round 2 due to low sample volumes of groundwater encountered at each sampling station (USEPA 2004a and 2004b). Thus, the precision of metal analyses in groundwater from these sampling rounds could not be evaluated using the field split approach. Field splits were collected during Round 3 and Round 4 water sampling at the required frequency (6% and 11%, respectively) and meet the required criteria (RPD ≤25%) for each chemical analyzed. Thus, the precision of metals analysis in Round 3 and Round 4 water samples is adequate.

E1.2 Field Blanks (Water)

Field blanks for water are samples that are collected in the field by adding a sample of distilled or de-ionized water to the sample bottle rather than a sample of site water. The samples are submitted blind to the laboratory to test for any contamination introduced during the collection, transport and storage of a sample. For the Phase I investigation, field blanks were to be collected for groundwater at a frequency of 5% of all groundwater samples collected (1 field blank for every 20 samples collected). However, based on the total number of groundwater samples collected (2 samples during Round 1; 15 samples in Round 2; 17 samples in Round 3; and 9 samples in Round 4), field blanks were not collected for groundwater during any sampling round. Thus, no conclusions can be drawn about the potential for contamination using this approach.

E1.3 Equipment Blank (Rinsate)

Equipment blanks are samples of water produced from rinsing equipment that has been decontaminated after sampling. These samples (rinsates) are submitted to the laboratory to determine if field decontamination procedures are effective in preventing cross-contamination between samples. The acceptance criteria for a rinsate sample is that all analytes should be below method detection limits.

As shown in Table E-1, equipment blanks were collected from soil sampling equipment at a frequency of 14% (one equipment blank per day. For Rounds 2-4, equipment blanks were collected from groundwater sampling equipment at a frequencies of 11-13%. Consistent with the project plan (USEPA 2003), equipment blanks were not collected during the first round of groundwater sampling because all sampling equipment was disposable.

Table E-3 presents the detailed evaluation of the concentration of metals in rinsate samples. The initial acceptance criteria (all values less than the method detection limit) was changed to all samples less than the reporting limit, because non-detects observed during the Phase I investigation were reported as less than the method reporting limit rather than the method detection limit.

For rinsates from soil sampling equipment (Table E-3, Part A), many analytes were below the reporting limit in all samples. However, several analytes (aluminum, calcium, iron, and manganese) were above reporting limits in one or more samples. These results suggest that some cross-contamination between soil samples may have occurred during field collection activities. However, because the detected concentrations in rinsates were low (typically within 1-2 times the reporting limit), and because all of the analytes detected occur at relatively high levels in soil, the amount of cross-contamination is not likely to significantly effect the measured values in the soil samples. Thus, these rinsate results do not suggest the soil sample results are unreliable.

For rinsates from groundwater sampling equipment (Table E-3, Part B), most analytes were below the method reporting limit in all samples, except for calcium in one sample. These results indicate that cross-contamination between groundwater samples is likely to be minimal and that the groundwater results are reliable.

E1.4 PE Standards

PE standards are sample media (soil, water) with a known concentration of target analytes that are used to help evaluate the accuracy of the analytical results. They are submitted blind to the laboratory at a frequency of 5% or one per preparation batch.

PE standards of soil and water used in the Phase I investigation were provided by EPA's Quality Assurance Technical Support (QATS) laboratory. PE standards prepared by QATS are sent to a number of laboratories for analysis. From the results the average concentration and confidence intervals around the mean are calculated and used to establish acceptance criteria. The accuracy requirement used to evaluate the PE standards analyzed during the Phase I investigation are the 95% and 99% confidence intervals around the mean. Measured concentrations that are within the 95% confidence interval are considered to be within acceptable accuracy limits. Concentrations that exceed the 95% confidence interval but are within the 99% confidence interval are still acceptable, but are approaching unacceptable limits. Acceptance criteria for the QATS samples used in this study are presented in Table E-4.

Table E-4 (Part A) compares the results for five replicate analyses of the soil PE sample with the performance criteria recommended by QATS. As shown, concentration values for arsenic, lead and zinc tended to be biased slightly high (generally in the range of 10%-25%), but 16 out of 20 results are within the 95% CI, and all results are within the 99% CI.

Table E-4 (Part B) compares the results for the analyses of 5 water PE samples with the QATS acceptance criteria. As seen, the results for one sample (MW-30-050205) are below both the 95th and 99% CI for all analyses. The measured concentrations in this sample are approximately 4 times less than the nominal standard concentration for all analytes, suggesting either a dillution or analytical error may have occurred. Another possible explanation for the low analytical results for this sample is degradation of the PE standard. Prior to analysis, the PE standard (sample MW-30-050205) was stored frozen for a period of 17 months. Freezing of aqueous standards may result in some degradation of analytes, especially antimony, iron, and vanadium (USEPA 2005). Thus, the stability of at least some metals in this PE standard could be questionable and therefore not a good indicator of the analytical accuracy of the field samples analyzed with this QC sample. Thus, the results for PE standard sample MW-30-050205 were not used to draw conclusions on the analytical accuracy of metals analysis in water samples.

For the remaining water PE samples, Table E-4 (Part B) shows that in most cases (3 of the 4 samples) the results showed little tendency for bias, and 15 out of 16 results are within both the

95% and 99% CI. However, the result for one analysis of zinc falls above the 99% CI, indicating that the analytical results for zinc could be biased high (about 40%) for field samples analyzed in the same sample batch. Based on this, the overall accuracy of quantifying metals in water samples is adequate.

E2. LABORATORY QC SAMPLES

Five types of laboratory QC samples for soil and groundwater were analyzed during the Phase I investigation, including matrix spikes, laboratory control samples, laboratory duplicates, instrument blanks, and method blanks. The required frequency, acceptance criteria and evaluation of the results[1] for each laboratory QC sample are briefly described below and are summarized in Table E-1.

E2.1 Matrix Spike

A matrix spike (MS) is a field sample to which a known concentration of one or more analytes has been added. This QC sample measures the extent that the sample matrix influences the accuracy of the measurement of target analytes. The frequency that matrix spikes are introduced into the sampling train is either 5% (one matrix spike for every 20 field samples) or one matrix spike for every batch of samples prepared for analysis (whichever is more frequent). The results from the matrix spike are evaluated by determining the percent recovery of the analytes added to the field sample. Percent recoveries that are within the documented historical laboratory matrix spike recoveries meet QC acceptance criteria.

As shown in Table E-1, matrix spike samples were prepared and analyzed at a frequency of one matrix spike per sample batch. Table E-5 presents the detailed evaluation of the spike concentrations and percent recoveries in matrix spike samples. Table E-5 Part A shows the results for soil, and Part B shows the results for groundwater.

[1]Note that the tables in Appendix E are based on laboratory QC samples analyzed with soil and Rounds 2, 3 and 4 groundwater samples only. Laboratory QC samples analyzed with the Round 1 groundwater samples were not available electronically, and thus are not included in Appendix E tables. However, these sample results were evaluated during the data validation (see Section 3.3.1 and Appendix D) and the findings are included in the text of Appendix E.

In cases where the concentration of the analyte in the field sample used for spiking was more than four times greater than the spiked concentration, no evaluation of recovery was performed. In soil samples, this occurred mainly for aluminum, iron, and manganese, and, to a lesser extent, barium, cadmium, copper, and zinc. In water, this occurred mainly for aluminum.

As seen, most metals in matrix spike samples are within documented historical laboratory recoveries, with an overall exceedence rate of 5% of all analyses for soil samples and 3% for all water samples, and with no consistent pattern of exceedences across media or analytes. This indicates that the overall recovery of spiked metals is within expected limits, and indicates that matrix interferences are not likely to be important. However, in accord with standard procedure, analytes in field samples evaluated in a sample batch where the matrix spike for the analyte exceeded QC evaluation criteria were assigned a qualifier of "J" (estimated).

E2.2 Laboratory Control Sample (LCS)

A Laboratory Control Sample (LCS) is similar in purpose to a PE sample. That is, it is a sample with certified concentrations of one or more analytes, generally purchased from a commercial laboratory or from NIST. However, LCS samples are inserted by the analytical laboratory, and are not blind. The frequency that LCS samples are analyzed is 5% or one per analysis batch (whichever is more frequent). The results of the LCS samples are evaluated by comparing the measured recovery of each analyte to the acceptance criteria identified by the certifying laboratory.

As shown in Table E-1, LCS were analyzed at a frequency of one per batch during the Phase I investigation. Table E-6 presents the details of the LCS percent recoveries. All LCS met the QC acceptance criteria, with the exception of beryllium in one Round 1 water sample (see data validation report in Appendix D for details). The groundwater field samples analyzed in the same batch as this LCS were assigned a "J" qualifier to indicate that the reported concentration in the samples is estimated due to a LCS recovery outside the QC acceptance criteria. Based on this, the overall accuracy of the method for quantifying metals in soil and groundwater is adequate.

E2.3 Laboratory Duplicate

Laboratory duplicates are splits prepared by the laboratory to evaluate the precision of the sample preparation and analysis. Duplicates are analyzed at a frequency of 5% of all field samples analyzed or one per batch of samples (which ever is more frequent). The QC acceptance criteria for laboratory duplicates is an RPD less than or equal to 25%.

Laboratory duplicate samples were prepared and analyzed for Round 1 water samples. Because the analytical results for Round 1 laboratory duplicate samples were not provided by the laboratory electronically, the results are not included in Appendix E tables. However, the precision of these samples was evaluated during data validation and the findings are included in the discussion below. For soil samples and water collected during Round 2, the analytical laboratory did not prepare laboratory duplicates. Therefore, in accord with analytical Method SW-846 6010, Matrix Spike Duplicate (MSD) and matrix spike (MS) results were used as a proxy to evaluate laboratory precision.

Table E-1 shows that duplicates were analyzed at the required frequency. Results for soil duplicate pairs are shown in Table E-7 Part A. As seen, most analyses (158 out of 164 = 96%) in soil are within QC acceptance criteria, with the exception of a few analytes (mercury, lead, aluminum, and iron) in four different duplicate samples. In accordance with the National Functional Guidelines for data validation, a "J" qualifier was assigned to soil analyses that exceeded 35% RPD.

Results for water samples (groundwater and rinsates) are shown in Table E-7, Part B. As above, most results are within the QC acceptance criteria, with the exception of cadmium and lead in one Round 1 groundwater sample. The cadmium and lead results in the field samples analyzed in the same sample batch as the laboratory duplicate that exceeded the duplicate QC criteria were "J" qualified to indicate that the reported concentration is estimated because QC criteria were not met (see Appendix D). Because the frequency of exceedences is low and the magnitude of the exceedences is generally small, and since there is no consistent pattern of exceedences across analytes, the overall precision of the analysis of metals in soil and water is judged to be adequate.

E2.4 Method Blank

Method blanks are samples composed of the reagents, solvents, or matrix of investigative samples following sample preparation that are used to determine if any laboratory induced contamination has occurred. They are analyzed at a frequency of 5% of all samples analyzed or one per sample batch. The results are compared to the method detection limits (MDLs). Samples where analytes are less than or equal to method detection limits are within QC acceptance criteria.

As shown in Tables E-1 and E-8, method blanks were analyzed at the required frequency and all results were within QC acceptance criteria, with the exception of one blank sample analyzed with the Round 1 groundwater (see data validation report in Appendix D for details). In this sample, a negative concentration of sodium was reported in one of the blanks analyzed with a batch of field samples. Because the sodium result in a field sample analyzed in the same sample batch was less than five times the absolute value of the blank, the sodium result for the field sample was qualified as "J" (estimated). Based on this, it does not appear that laboratory induced contamination was introduced into the Phase I soil or groundwater samples. Thus, the overall accuracy of the analytical data collected during Phase I is adequate for the analysis of metals in soil and groundwater samples.

E3. DATA QUALITY SUMMARY

Precision of the analytical data was evaluated by evaluating field split and laboratory duplicate samples. As described above, all field split sample results met QC criteria for precision. Likewise, most laboratory duplicates were within QC acceptance criteria, with a few exceptions. Because the frequency of samples exceeding QC acceptance criteria for precision is low, and because there is no consistent pattern of exceedences across analytes or media, the overall precision of the analysis of metals in soil and water is judged to be adequate.

The accuracy of the analytical data was evaluated by several different types of QC samples, including rinsates, PE standards, matrix spikes, laboratory control samples, laboratory duplicates, and method blanks. Most of these QC sample results were within specified acceptance criteria, indicating that the data are within acceptable accuracy bounds. Occasional exceedences were observed in a few QC samples, but overall there was no clear pattern suggesting systematic error. For example, results for one water PE sample suggested that results for zinc may be biased high, but zinc analyses in all other QC water samples were all within acceptable limits.

Based on the evaluation of precision and accuracy described above, the quality of the analytical data collected during the Phase I field investigation at the VBI70 OU3 site are adequate for use in describing the nature of site contamination and for use in risk assessment.

E4. REFERENCES

USEPA. 2003. Vasquez Boulevard and Interstate 70 (VBI70) Operable Unit 3 (OU3) Denver, Colorado. Quality Assurance Project Plan and Sampling and Analysis Plan to Support Human and Ecological Risk Assessment and Remedial Investigation. Prepared for USEPA by Knight Piesold and Syracuse Research Corporation. December.

USEPA. 2004a. Field Sampling Report, Round I, Phase I for the Vasquez Boulevard and Interstate 70 (VBI70) Site, Operable Unit 3 (OU3), Denver, Colorado. Prepared for USEPA by Knight Piesold and Co. March.

USEPA. 2004b. Draft Technical Memorandum Phase I, Round II Groundwater Monitoring Vasquez Boulevard and Interstate 70 (VBI70), Operable Unit 3 (OU3) Denver Colorado. Prepared by Knight Piésold. September 13.

USEPA. 2005. Vasquez Boulevard PES Evaluation Report. Prepared by USEPA Region 8. June.

Table E-1. Precision, Accuracy, Representativeness and Completeness of Data Collected During the Phase I Investigation

QC Type	Sample Type	Sample Matrix	Proposed Frequency	Actual Frequency	Initial Acceptance Criteria	Evaluation of Acceptance Criteria	Data Quality Assessment Conclusion
Field QC	Field Split	Soil, Groundwater	5% of all field samples. (1 field duplicate per 20)	5% (6 soil duplicates/123 soil samples) for soil. Field split not collected for groundwater during Round 1 due to sample size (2 groundwater field samples collected) or during Round 2 due to low recoveries of monitoring wells. Round 3 frequency of 6% (1 duplicate/17 water samples).	RPD < 25% or, the absolute difference should not exceed 1 x MDL.	All field split soil samples and Round 3 water samples were within the acceptance criteria (RPD < 25%).	Precision adequate for soil and Round 3 water analyses. Precision could not be evaluated for Round 1 or Round 2 water samples.
	Field Blank	Groundwater	5% of all field samples. (1 field blank per 20)	No field blanks collected for groundwater (2 groundwater samples collected during Round 1, 15 groundwater samples collected during Round 2 and 17 water samples collected during Round 3).	Target analytes <1 x MDL; 5-10 x MDL for laboratory-induced contaminants	Could not be evaluated.	Could not be evaluated.
	Rinsate	Soil, Groundwater	5% of all decontaminations performed on each type of equipment	14% of soil sampling equipment decontaminations (5/36 boreholes). 13% of decontaminations (2/15 decontaminations) during Round 2 sampling and 12% of Round 3 decontaminations. None collected during Round 1 groundwater sampling (all equipment disposable, thus no equipment decontaminations).	Target analytes <1 x MDL; 5-10 x MDL for laboratory-induced contaminants. [1]	For soil sampling rinsates, results were within acceptance criteria for all chemicals, with the exception of aluminum, calcium, iron and to a lesser extent manganese in one or more samples. For groundwater sampling rinsates, all results were within acceptance criteria except for calcium in one sample.	Field sampling-induced contamination may have been introduced for aluminum, calcium, iron and manganese in soil and for calcium in Round 2 groundwater. However the estimated contribution from field-induced contamination relative to the total measured concentration is relatively small (1-2 times the RL) for the sample groups impacted, the exceedences are for common elements that could be introduced by the water and/or sampling equipment, and thus, are not likely to significantly impact reported concentrations.
	PE Standard	Soil, Groundwater	5% or 1 per batch (whichever is more frequent)	Soil PE standards submitted at a frequency of one per batch once they became available (after soil sampling began). Groundwater PE standards submitted at a frequency of one per batch during Round 1, a frequency of 5% (1/18 samples) during Round 2, and a frequency of 6% (1/17 samples) during Round 3.	Compare results with accuracy requirements provided by the certifying laboratory: within 95% CI around the mean (acceptable); outside the 95% CI but within 99% CI around the mean (acceptable, but approaching acceptable limits).	For soil PE samples, concentrations may be biased high for arsenic, lead and zinc, but all results are within acceptance criteria. For water PE samples, all results are within acceptance criteria with the exception of zinc in one sample. Results for one water PE sample rejected, due to questionable stability of metals in standard from storage conditions (frozen for 17 months, prior to analysis).	Overall accuracy adequate for quantifying metals in soil and groundwater.
Laboratory QC	Matrix Spike	Soil, Groundwater	5% or 1 per batch (whichever is more frequent)	One matrix spike was analyzed per batch of samples.	75 - 125% of known value or within the documented historical laboratory acceptance limits for each chemical [2]	Results within acceptance criteria for all chemicals in soil, with the exception of at least one chemical (aluminum, iron and manganese, and to a lesser extent barium, cadmium, copper and zinc) in 7/8 matix spike samples (2% of analyses). For groundwater, results were within acceptance criteria for all chemicals with the exception of at least one chemical (antimony and aluminum and to a lesser extent arsenic, lead, selenium, thallium, beryllium and vanadium in one sample) in 6/15 matrix spike samples (3% of analyses).	Matrix interferences could be occurring for some chemicals. However, overall recoveries are within expected limits. Thus, matrix interferences are not likely to be important and overall accuracy is adequate for quantifying metals in soil and groundwater.
	Laboratory Control Sample	Soil, Groundwater	5% or 1 per batch (whichever is more frequent)	One laboratory control sample was analyzed per batch of samples.	Must be within manufacturer's established acceptance limits.	Results within acceptance criteria for all chemicals in soil and groundwater with the exception of beryllium in one Round 1 groundwater sample.	Overall accuracy adequate for quantifying metals in soil and groundwater.

Table E-1. Precision, Accuracy, Representativeness and Completeness of Data Collected During the Phase I Investigation

QC Type	Sample Type	Sample Matrix	Proposed Frequency	Actual Frequency	Initial Acceptance Criteria	Evaluation of Acceptance Criteria	Data Quality Assessment Conclusion
Laboratory QC	Laboratory Duplicate	Soil, Groundwater	5% or 1 per batch (whichever is more frequent)	One laboratory control duplicate sample was analyzed per batch of soil and water samples.	RPD < 25% or, the absolute difference should not exceed 1 x MDL.	Soil duplicates were within QC acceptance criteria for most analyses (158 out of 164), with the exception of a few analytes (mercury, lead, aluminum and iron) in 4 duplicate samples. *Groundwater duplicate results were within QC acceptance criteria with the exception of cadmium and lead in one sample.*	Overall, precision of soil and groundwater analyses is adequate.
	Method Blank	Soil, Groundwater	5% or 1 per batch (whichever is more frequent)	One method blank was analyzed per batch of samples.	< 1 x MDL except for common laboratory *contaminants which may be 5-10 x MDL.* If any analyte concentration is > PQL, the lowest concentration of that analyte in the associated samples must be 10x more than the conc. found in the blank.	Results within acceptance criteria in soil and groundwater *with the exception of sodium in one Round 1 blank sample.*	No indication that laboratory-induced contamination has occurred. *The accuracy of metal analysis in soil and groundwater samples is* adequate.

MDL - Method Detection Limit
RPD - Relative Percent Difference

[1] *Acceptance criteria revised from "<1x MDL", 5-10 x MDL" to "<1x RL; 5-10x RL", as Phase 1 data were not reported below the Method reporting limit (RL).*
[2] Revised from "75% - 125% of known value" to read "75 - 125% of known value or within the documented historical laboratory acceptance limits for each chemical", based on conversations with STL and is consistent with Method SW 848 6010B.

Table E-2. Data Quality Assessment
Evaluation of Field Split Sample Results

A. SOIL FIELD SPLIT SAMPLES

Field Split Sample ID	Parent Sample ID	Anayte	Analyte Type	Field Split Result (mg/kg)			Parent Sample Result (mg/kg)		RPD (%)	QC Acceptance Criteria Evaluation
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Aluminum	Total	32000	mg/kg		28000		3.3%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Antimony	Total	ND	mg/kg	UJ	ND	UJ	0.0%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Arsenic	Total	1.7	mg/kg		3.9		19.6%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Barium	Total	72	mg/kg		69		1.1%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Beryllium	Total	0.88	mg/kg		0.82		1.8%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Cadmium	Total	24	mg/kg		25		1.0%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Calcium	Total	8800	mg/kg		7500		4.0%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Chromium	Total	16	mg/kg	J	14	J	3.3%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Cobalt	Total	12	mg/kg		9.3		6.3%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Copper	Total	29	mg/kg	J	67	J	19.8%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Iron	Total	25000	mg/kg		25000		0.0%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Lead	Total	19	mg/kg		18		1.4%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Magnesium	Total	4100	mg/kg		3800		1.9%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Manganese	Total	340	mg/kg		310		2.3%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Mercury	Total	0.033	mg/kg		ND		16.7%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Nickel	Total	58	mg/kg		61		1.3%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Potassium	Total	2500	mg/kg		2200		3.2%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Selenium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Silver	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Sodium	Total	1400	mg/kg		1300		1.9%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Thallium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Vanadium	Total	43	mg/kg		37		3.8%	pass
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Zinc	Total	440	mg/kg		520		4.2%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Aluminum	Total	29000	mg/kg		31000		1.7%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Antimony	Total	ND	mg/kg	UJ	ND	UJ	0.0%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Arsenic	Total	18	mg/kg		22		5.0%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Barium	Total	1400	mg/kg	J	1500	J	1.7%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Beryllium	Total	ND	mg/kg		ND	UJ	0.0%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Cadmium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Calcium	Total	15000	mg/kg		13000		3.6%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Chromium	Total	7.1	mg/kg		7.6		1.7%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Cobalt	Total	10	mg/kg		12		4.5%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Copper	Total	13	mg/kg		15		3.6%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Iron	Total	20000	mg/kg		23000		3.5%	pass
01-VBOU3-SB-0015-C	01-VBOU3-SB-0016-B	Lead	Total	9.2	mg/kg		10		2.1%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Magnesium	Total	4000	mg/kg		4100		0.6%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Manganese	Total	340	mg/kg		380		2.8%	pass

Table E-2. Data Quality Assessment
Evaluation of Field Split Sample Results

A. SOIL FIELD SPLIT SAMPLES

Field Split Sample ID	Parent Sample ID	Anayte	Analyte Type	Field Split Result (mg/kg)			Parent Sample Result (mg/kg)		RPD (%)	QC Acceptance Criteria Evaluation
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Aluminum	Total	32000	mg/kg		28000		3.3%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Mercury	Total	ND	mg/kg	UJ	ND	UJ	0.0%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Nickel	Total	6.4	mg/kg		7.3		3.3%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Potassium	Total	1300	mg/kg		1400		1.9%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Selenium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Silver	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Sodium	Total	2400	mg/kg		2700		2.9%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Thallium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Vanadium	Total	42	mg/kg		45		1.7%	pass
01-VBOU3-SB-0016-C	01-VBOU3-SB-0016-B	Zinc	Total	46	mg/kg	J	54	J	4.0%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Aluminum	Total	36000	mg/kg		37000		0.7%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Antimony	Total	ND	mg/kg	UJ	ND	UJ	0.0%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Arsenic	Total	2.5	mg/kg		3		4.5%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Barium	Total	1300	mg/kg		1200		2.0%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Beryllium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Cadmium	Total	0.84	mg/kg		0.69		4.9%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Calcium	Total	15000	mg/kg		15000		0.0%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Chromium	Total	7.3	mg/kg		5.9		5.3%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Cobalt	Total	14	mg/kg		13		1.9%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Copper	Total	4.6	mg/kg		5.2		3.1%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Iron	Total	33000	mg/kg		30000		2.4%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Lead	Total	7.5	mg/kg	J	7.8	J	1.0%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Magnesium	Total	8500	mg/kg		8800		0.9%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Manganese	Total	1000	mg/kg	J	1000	J	0.0%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Mercury	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Nickel	Total	4.8	mg/kg		4.7		0.5%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Potassium	Total	790	mg/kg		790		0.0%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Selenium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Silver	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Sodium	Total	1400	mg/kg		1300		1.9%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Thallium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Vanadium	Total	73	mg/kg		59		5.3%	pass
01-VBOU3-SB-0018-D	01-VBOU3-SB-0018-C	Zinc	Total	66	mg/kg		60		2.4%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Aluminum	Total	24000	mg/kg		27000		2.9%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Antimony	Total	ND	mg/kg	UJ	ND	UJ	0.0%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Arsenic	Total	32	mg/kg		53		12.4%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Barium	Total	650	mg/kg		700		1.9%	pass

Table E-2. Data Quality Assessment
Evaluation of Field Split Sample Results

A. SOIL FIELD SPLIT SAMPLES

Field Split Sample ID	Parent Sample ID	Anayte	Analyte Type	Field Split Result (mg/kg)			Parent Sample Result (mg/kg)		RPD (%)	QC Acceptance Criteria Evaluation
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Aluminum	Total	32000	mg/kg		28000		3.3%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Beryllium	Total	0.53	mg/kg		ND		17.9%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Cadmium	Total	ND	mg/kg	G	ND	G	1.9%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Calcium	Total	10000	mg/kg		12000		4.5%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Chromium	Total	7.7	mg/kg	J	8.7	J	3.0%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Cobalt	Total	12	mg/kg		12		0.0%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Copper	Total	13	mg/kg		18		8.1%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Iron	Total	25000	mg/kg		28000		2.8%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Lead	Total	9.5	mg/kg		10		1.3%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Magnesium	Total	4300	mg/kg		4900		3.3%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Manganese	Total	740	mg/kg		700		1.4%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Mercury	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Nickel	Total	5.8	mg/kg		6.5		2.8%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Potassium	Total	1300	mg/kg		1500		3.6%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Selenium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Silver	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Sodium	Total	1900	mg/kg	J	2200	J	3.7%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Thallium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Vanadium	Total	52	mg/kg	J	55	J	1.4%	pass
01-VBOU3-SB-0024-B	01-VBOU3-SB-0024-A	Zinc	Total	65	mg/kg	J	80	J	5.2%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Aluminum	Total	24000	mg/kg		25000		1.0%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Antimony	Total	ND	mg/kg	UJ	ND	UJ	0.0%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Arsenic	Total	3.6	mg/kg		4.1		3.2%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Barium	Total	78	mg/kg		110		8.5%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Beryllium	Total	1	mg/kg		1		0.0%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Cadmium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Calcium	Total	7200	mg/kg		7000		0.7%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Chromium	Total	11	mg/kg		13		4.2%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Cobalt	Total	7.5	mg/kg		7.1		1.4%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Copper	Total	17	mg/kg		19		2.8%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Iron	Total	24000	mg/kg		24000		0.0%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Lead	Total	22	mg/kg		50		19.4%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Magnesium	Total	3300	mg/kg		3700		2.9%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Manganese	Total	760	mg/kg	J	520	J	9.4%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Mercury	Total	0.046	mg/kg		0.039		4.1%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Nickel	Total	9.1	mg/kg		9.1		0.0%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Potassium	Total	1500	mg/kg		2100		8.3%	pass

Table E-2. Data Quality Assessment
Evaluation of Field Split Sample Results

A. SOIL FIELD SPLIT SAMPLES

Field Split Sample ID	Parent Sample ID	Anayte	Analyte Type	Field Split Result (mg/kg)			Parent Sample Result (mg/kg)		RPD (%)	QC Acceptance Criteria Evaluation
01-VBOU3-SB-0006-D	01-VBOU3-SB-0006-C	Aluminum	Total	32000	mg/kg		28000		3.3%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Selenium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Silver	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Sodium	Total	830	mg/kg		790		1.2%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Thallium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Vanadium	Total	36	mg/kg	J	35	J	0.7%	pass
01-VBOU3-SB-0026-C	01-VBOU3-SB-0026-B	Zinc	Total	70	mg/kg		87		5.4%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Aluminum	Total	7200	mg/kg		8000		2.6%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Antimony	Total	ND	mg/kg	UJ	ND	UJ	0.0%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Arsenic	Total	2.3	mg/kg		2.6		3.1%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Barium	Total	67	mg/kg	J	73	J	2.1%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Beryllium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Cadmium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Calcium	Total	3200	mg/kg		3600		2.9%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Chromium	Total	15	mg/kg		16		1.6%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Cobalt	Total	5.5	mg/kg		6		2.2%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Copper	Total	7.5	mg/kg		7.3		0.7%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Iron	Total	15000	mg/kg		16000		1.6%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Lead	Total	10	mg/kg	J	12	J	4.5%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Magnesium	Total	2200	mg/kg		2400		2.2%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Manganese	Total	220	mg/kg	J	250	J	3.2%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Mercury	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Nickel	Total	7.6	mg/kg		8.2		1.9%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Potassium	Total	1900	mg/kg		2100		2.5%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Selenium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Silver	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Sodium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Thallium	Total	ND	mg/kg		ND		0.0%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Vanadium	Total	25	mg/kg		27		1.9%	pass
01-VBOU3-SB-0034-D	01-VBOU3-SB-0034-C	Zinc	Total	38	mg/kg		41		1.9%	pass

pass = RPD of measured concentration between parent sample and field split sample is within QC acceptance criteria (<25%). Analytical precision is acceptable.

QC = Quality control

Table E-2. Data Quality Assessment
Evaluation of Field Split Sample Results

B. WATER FIELD SPLIT SAMPLES

Field Split Sample ID	Parent Sample ID	Anayte	Analyte Type	Field Split Result (ug/L)	Parent Sample Result (ug/L)	RPD (%)	QC Acceptance Criteria Evaluation
KP-GW-46-111904A	KP-GW-46-111904	Aluminum	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Antimony	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Arsenic	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Barium	Dissolved	77	77	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Beryllium	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Cadmium	Dissolved	24	24	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Calcium	Dissolved	190000	190000	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Chromium	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Cobalt	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Copper	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Iron	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Lead	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Magnesium	Dissolved	29000	29000	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Manganese	Dissolved	12	ND	20.6%	pass
KP-GW-46-111904A	KP-GW-46-111904	Mercury	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Nickel	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Potassium	Dissolved	6500	6400	0.4%	pass
KP-GW-46-111904A	KP-GW-46-111904	Selenium	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Silver	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Sodium	Dissolved	240000	240000	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Thallium	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Vanadium	Dissolved	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Zinc	Dissolved	180	180	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Aluminum	Total	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Antimony	Total	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Arsenic	Total	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Barium	Total	78	80	0.6%	pass
KP-GW-46-111904A	KP-GW-46-111904	Beryllium	Total	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Cadmium	Total	23	24	1.1%	pass
KP-GW-46-111904A	KP-GW-46-111904	Calcium	Total	190000	200000	1.3%	pass
KP-GW-46-111904A	KP-GW-46-111904	Chromium	Total	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Cobalt	Total	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Copper	Total	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Iron	Total	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Lead	Total	ND	ND	0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Magnesium	Total	29000	30000	0.8%	pass
KP-GW-46-111904A	KP-GW-46-111904	Manganese	Total	11	11	0.0%	pass

Table E-2. Data Quality Assessment
Evaluation of Field Split Sample Results

B. WATER FIELD SPLIT SAMPLES

Field Split Sample ID	Parent Sample ID	Anayte	Analyte Type	Field Split Result (ug/L)			Parent Sample Result (ug/L)		RPD (%)	QC Acceptance Criteria Evaluation
KP-GW-46-111904A	KP-GW-46-111904	Mercury	Total	ND			ND		0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Nickel	Total	ND			ND		0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Potassium	Total	6700			6700		0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Selenium	Total	ND			ND		0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Silver	Total	ND			ND		0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Sodium	Total	250000			250000		0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Thallium	Total	ND			ND		0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Vanadium	Total	ND			ND		0.0%	pass
KP-GW-46-111904A	KP-GW-46-111904	Zinc	Total	160		J	170	J	1.5%	pass
KP-PS-11-092005A	KP-PS-11-092005	Aluminum	Total	9900			8200		4.7%	pass
KP-PS-11-092005A	KP-PS-11-092005	Antimony	Total	ND		UJ	ND	UJ	0.0%	pass
KP-PS-11-092005A	KP-PS-11-092005	Arsenic	Total	3.2			2.8		3.3%	pass
KP-PS-11-092005A	KP-PS-11-092005	Barium	Total	250			230		2.1%	pass
KP-PS-11-092005A	KP-PS-11-092005	Beryllium	Total	ND			ND		0.0%	pass
KP-PS-11-092005A	KP-PS-11-092005	Cadmium	Total	ND			ND		0.0%	pass
KP-PS-11-092005A	KP-PS-11-092005	Calcium	Total	150000			160000		1.6%	pass
KP-PS-11-092005A	KP-PS-11-092005	Chromium	Total	13			12		2.0%	pass
KP-PS-11-092005A	KP-PS-11-092005	Cobalt	Total	13			13		0.0%	pass
KP-PS-11-092005A	KP-PS-11-092005	Copper	Total	18			16		2.9%	pass
KP-PS-11-092005A	KP-PS-11-092005	Iron	Total	13000			12000		2.0%	pass
KP-PS-11-092005A	KP-PS-11-092005	Lead	Total	19			19		0.0%	pass
KP-PS-11-092005A	KP-PS-11-092005	Magnesium	Total	34000			35000		0.7%	pass
KP-PS-11-092005A	KP-PS-11-092005	Manganese	Total	460			440		1.1%	pass
KP-PS-11-092005A	KP-PS-11-092005	Mercury	Total	ND		R	ND	R	0.0%	pass
KP-PS-11-092005A	KP-PS-11-092005	Nickel	Total	ND			ND		0.0%	pass
KP-PS-11-092005A	KP-PS-11-092005	Potassium	Total	23000			22000		1.1%	pass
KP-PS-11-092005A	KP-PS-11-092005	Selenium	Total	ND			ND		0.0%	pass
KP-PS-11-092005A	KP-PS-11-092005	Silver	Total	ND			ND		0.0%	pass
KP-PS-11-092005A	KP-PS-11-092005	Sodium	Total	240000			240000		0.0%	pass
KP-PS-11-092005A	KP-PS-11-092005	Thallium	Total	ND			ND		0.0%	pass
KP-PS-11-092005A	KP-PS-11-092005	Vanadium	Total	18			16		2.9%	pass
KP-PS-11-092005A	KP-PS-11-092005	Zinc	Total	91			90		0.3%	pass

pass = RPD of measured concentration between parent sample and field split sample is within QC acceptance criteria (<25%). Analytical precision is acceptable.

QC = Quality control

Table E-3. Data Quality Assessment
Evaluation of Equipment Blank (Rinsate) Samples

A. SOIL SAMPLING EQUIPMENT RINSATE

Anayte	Sample ID	Anayte	Reporting Limit (mg/kg)	Measured Concentration (mg/kg)		QC Acceptance Criteria Evaluation
Aluminum	01-VBOU3-RIN-0001	Aluminum	100	ND		pass
	01-VBOU3-RIN-0002	Aluminum	100	210		**fail**
	01-VBOU3-RIN-0003	Aluminum	100	ND		pass
	01-VBOU3-RIN-0004	Aluminum	100	120		**fail**
	01-VBOU3-RIN-0005	Aluminum	100	110		**fail**
Antimony	01-VBOU3-RIN-0001	Antimony	2	ND	R	NA
	01-VBOU3-RIN-0002	Antimony	2	ND		pass
	01-VBOU3-RIN-0003	Antimony	2	ND		pass
	01-VBOU3-RIN-0004	Antimony	2	ND		pass
	01-VBOU3-RIN-0005	Antimony	2	ND		pass
Arsenic	01-VBOU3-RIN-0001	Arsenic	1	ND		pass
	01-VBOU3-RIN-0002	Arsenic	1	ND		pass
	01-VBOU3-RIN-0003	Arsenic	1	ND		pass
	01-VBOU3-RIN-0004	Arsenic	1	ND		pass
	01-VBOU3-RIN-0005	Arsenic	1	ND		pass
Barium	01-VBOU3-RIN-0001	Barium	10	ND		pass
	01-VBOU3-RIN-0002	Barium	10	ND		pass
	01-VBOU3-RIN-0003	Barium	10	ND		pass
	01-VBOU3-RIN-0004	Barium	10	ND		pass
	01-VBOU3-RIN-0005	Barium	10	ND		pass
Beryllium	01-VBOU3-RIN-0001	Beryllium	1	ND		pass
	01-VBOU3-RIN-0002	Beryllium	1	ND		pass
	01-VBOU3-RIN-0003	Beryllium	1	ND		pass
	01-VBOU3-RIN-0004	Beryllium	1	ND		pass
	01-VBOU3-RIN-0005	Beryllium	1	ND		pass

Table E-3. Data Quality Assessment
Evaluation of Equipment Blank (Rinsate) Samples

A. SOIL SAMPLING EQUIPMENT RINSATE

Anayte	Sample ID	Anayte	Reporting Limit (mg/kg)	Measured Concentration (mg/kg)	QC Acceptance Criteria Evaluation
Cadmium	01-VBOU3-RIN-0001	Cadmium	1	ND	pass
	01-VBOU3-RIN-0002	Cadmium	1	ND	pass
	01-VBOU3-RIN-0003	Cadmium	1	ND	pass
	01-VBOU3-RIN-0004	Cadmium	1	ND	pass
	01-VBOU3-RIN-0005	Cadmium	1	ND	pass
Calcium	01-VBOU3-RIN-0001	Calcium	200	ND	pass
	01-VBOU3-RIN-0002	Calcium	200	240	**fail**
	01-VBOU3-RIN-0003	Calcium	200	520	**fail**
	01-VBOU3-RIN-0004	Calcium	200	270	**fail**
	01-VBOU3-RIN-0005	Calcium	200	280	**fail**
Chromium	01-VBOU3-RIN-0001	Chromium	10	ND	pass
	01-VBOU3-RIN-0002	Chromium	10	ND	pass
	01-VBOU3-RIN-0003	Chromium	10	ND	pass
	01-VBOU3-RIN-0004	Chromium	10	ND	pass
	01-VBOU3-RIN-0005	Chromium	10	ND	pass
Cobalt	01-VBOU3-RIN-0001	Cobalt	10	ND	pass
	01-VBOU3-RIN-0002	Cobalt	10	ND	pass
	01-VBOU3-RIN-0003	Cobalt	10	ND	pass
	01-VBOU3-RIN-0004	Cobalt	10	ND	pass
	01-VBOU3-RIN-0005	Cobalt	10	ND	pass
Copper	01-VBOU3-RIN-0001	Copper	10	ND	pass
	01-VBOU3-RIN-0002	Copper	10	ND	pass
	01-VBOU3-RIN-0003	Copper	10	ND	pass
	01-VBOU3-RIN-0004	Copper	10	ND	pass
	01-VBOU3-RIN-0005	Copper	10	ND	pass

Table E-3. Data Quality Assessment
Evaluation of Equipment Blank (Rinsate) Samples

A. SOIL SAMPLING EQUIPMENT RINSATE

Anayte	Sample ID	Anayte	Reporting Limit (mg/kg)	Measured Concentration (mg/kg)		QC Acceptance Criteria Evaluation
Iron	01-VBOU3-RIN-0001	Iron	100	220	J	**fail**
	01-VBOU3-RIN-0002	Iron	100	420		**fail**
	01-VBOU3-RIN-0003	Iron	100	170		**fail**
	01-VBOU3-RIN-0004	Iron	100	180		**fail**
	01-VBOU3-RIN-0005	Iron	100	220		**fail**
Lead	01-VBOU3-RIN-0001	Lead	3	ND		pass
	01-VBOU3-RIN-0002	Lead	3	ND		pass
	01-VBOU3-RIN-0003	Lead	3	ND		pass
	01-VBOU3-RIN-0004	Lead	3	3		pass
	01-VBOU3-RIN-0005	Lead	3	ND		pass
Magnesium	01-VBOU3-RIN-0001	Magnesium	200	ND		pass
	01-VBOU3-RIN-0002	Magnesium	200	ND		pass
	01-VBOU3-RIN-0003	Magnesium	200	200		pass
	01-VBOU3-RIN-0004	Magnesium	200	ND		pass
	01-VBOU3-RIN-0005	Magnesium	200	ND		pass
Manganese	01-VBOU3-RIN-0001	Manganese	10	ND		pass
	01-VBOU3-RIN-0002	Manganese	10	ND		pass
	01-VBOU3-RIN-0003	Manganese	10	ND		pass
	01-VBOU3-RIN-0004	Manganese	10	ND		pass
	01-VBOU3-RIN-0005	Manganese	10	12		**fail**
Mercury	01-VBOU3-RIN-0001	Mercury	0.2	ND		pass
	01-VBOU3-RIN-0002	Mercury	0.2	ND		pass
	01-VBOU3-RIN-0003	Mercury	0.2	ND	R	NA
	01-VBOU3-RIN-0004	Mercury	0.2	ND		pass
	01-VBOU3-RIN-0005	Mercury	0.2	ND		pass

Table E-3. Data Quality Assessment
Evaluation of Equipment Blank (Rinsate) Samples

A. SOIL SAMPLING EQUIPMENT RINSATE

Anayte	Sample ID	Anayte	Reporting Limit (mg/kg)	Measured Concentration (mg/kg)		QC Acceptance Criteria Evaluation
Nickel	01-VBOU3-RIN-0001	Nickel	40	ND		pass
	01-VBOU3-RIN-0002	Nickel	40	ND		pass
	01-VBOU3-RIN-0003	Nickel	40	ND		pass
	01-VBOU3-RIN-0004	Nickel	40	ND		pass
	01-VBOU3-RIN-0005	Nickel	40	ND		pass
Potassium	01-VBOU3-RIN-0001	Potassium	3000	ND		pass
	01-VBOU3-RIN-0002	Potassium	3000	ND		pass
	01-VBOU3-RIN-0003	Potassium	3000	ND		pass
	01-VBOU3-RIN-0004	Potassium	3000	ND		pass
	01-VBOU3-RIN-0005	Potassium	3000	ND		pass
Selenium	01-VBOU3-RIN-0001	Selenium	15	ND		pass
	01-VBOU3-RIN-0002	Selenium	5	ND		pass
	01-VBOU3-RIN-0003	Selenium	15	ND		pass
	01-VBOU3-RIN-0004	Selenium	15	ND		pass
	01-VBOU3-RIN-0005	Selenium	15	ND		pass
Silver	01-VBOU3-RIN-0001	Silver	10	ND		pass
	01-VBOU3-RIN-0002	Silver	10	ND		pass
	01-VBOU3-RIN-0003	Silver	10	ND		pass
	01-VBOU3-RIN-0004	Silver	10	ND		pass
	01-VBOU3-RIN-0005	Silver	10	ND		pass
Sodium	01-VBOU3-RIN-0001	Sodium	5000	ND		pass
	01-VBOU3-RIN-0002	Sodium	5000	ND		pass
	01-VBOU3-RIN-0003	Sodium	5000	ND		pass
	01-VBOU3-RIN-0004	Sodium	5000	ND		pass
	01-VBOU3-RIN-0005	Sodium	5000	ND		pass

Table E-3. Data Quality Assessment
Evaluation of Equipment Blank (Rinsate) Samples

A. SOIL SAMPLING EQUIPMENT RINSATE

Anayte	Sample ID	Anayte	Reporting Limit (mg/kg)	Measured Concentration (mg/kg)	QC Acceptance Criteria Evaluation
	01-VBOU3-RIN-0001	Thallium	1	ND	pass
	01-VBOU3-RIN-0002	Thallium	1	ND	pass
Thallium	01-VBOU3-RIN-0003	Thallium	1	ND	pass
	01-VBOU3-RIN-0004	Thallium	1	ND	pass
	01-VBOU3-RIN-0005	Thallium	1	ND	pass
	01-VBOU3-RIN-0001	Vanadium	10	ND	pass
	01-VBOU3-RIN-0002	Vanadium	10	ND	pass
Vanadium	01-VBOU3-RIN-0003	Vanadium	10	ND	pass
	01-VBOU3-RIN-0004	Vanadium	10	ND	pass
	01-VBOU3-RIN-0005	Vanadium	10	ND	pass
	01-VBOU3-RIN-0001	Zinc	20	ND	pass
	01-VBOU3-RIN-0002	Zinc	20	ND	pass
Zinc	01-VBOU3-RIN-0003	Zinc	20	ND	pass
	01-VBOU3-RIN-0004	Zinc	20	ND	pass
	01-VBOU3-RIN-0005	Zinc	20	ND	pass

fail = Concentration in rinsate exceeds the QC acceptance criteria (1 x RL). Field sampling-induced contamination may have occurred.

NA = Acceptance criteria not evaluated. Measured concentration value "R" (reject) qualified, thus data not useable for data quality assessment.

ND = Concentration not detected at concentrations above the reporting limit.

pass = Concentration in rinsate is within acceptance criteria (1 X RL). Does not suggest field sampling-induced contamination has occurred.

R = Reject

QC = Quality control

Table E-3. Data Quality Assessment
Evaluation of Equipment Blank (Rinsate) Samples

B. GROUNDWATER SAMPLING EQUIPMENT RINSATE

Anayte	Sample ID	Anayte	Reporting Limit (ug/L)	Measured Concentration (ug/L)	QC Acceptance Criteria Evaluation
Cadmium	MW-31-111904	Cadmium	1	ND	pass
	MW-31-050205	Cadmium	1	ND	pass
	MW-31-091905	Cadmium	1	ND	pass
Calcium	MW-31-070104	Calcium	200	290	**fail**
	MW-31-072804	Calcium	200	ND	pass
	MW-31-111904	Calcium	200	ND	pass
	MW-31-050205	Calcium	200	ND	pass
	MW-31-091905	Calcium	200	ND	pass
Chromium	MW-31-070104	Chromium	10	ND	pass
	MW-31-072804	Chromium	10	ND	pass
	MW-31-111904	Chromium	10	ND	pass
	MW-31-050205	Chromium	10	ND	pass
	MW-31-091905	Chromium	10	ND	pass
Cobalt	MW-31-070104	Cobalt	10	ND	pass
	MW-31-072804	Cobalt	10	ND	pass
	MW-31-111904	Cobalt	10	ND	pass
	MW-31-050205	Cobalt	10	ND	pass
	MW-31-091905	Cobalt	10	ND	pass
Copper	MW-31-070104	Copper	10	ND	pass
	MW-31-072804	Copper	10	ND	pass
	MW-31-111904	Copper	10	ND	pass
	MW-31-050205	Copper	10	ND	pass
	MW-31-091905	Copper	10	ND	pass
Iron	MW-31-070104	Iron	100	ND	pass
	MW-31-072804	Iron	100	ND	pass
	MW-31-111904	Iron	100	ND	pass
	MW-31-050205	Iron	100	ND	pass
	MW-31-091905	Iron	100	ND	pass
Lead	MW-31-070104	Lead	3	ND	pass
	MW-31-072804	Lead	3	ND	pass
	MW-31-111904	Lead	3	ND	pass
	MW-31-050205	Lead	3	ND	pass
	MW-31-091905	Lead	3	ND	pass

Table E-3. Data Quality Assessment
Evaluation of Equipment Blank (Rinsate) Samples

B. GROUNDWATER SAMPLING EQUIPMENT RINSATE

Anayte	Sample ID	Anayte	Reporting Limit (ug/L)	Measured Concentration (ug/L)		QC Acceptance Criteria Evaluation
	MW-31-070104	Magnesium	200	ND		pass
	MW-31-072804	Magnesium	200	ND		pass
Magnesium	MW-31-111904	Magnesium	200	ND		pass
	MW-31-050205	Magnesium	200	ND		pass
	MW-31-091905	Magnesium	200	ND		pass
	MW-31-070104	Manganese	10	ND		pass
	MW-31-072804	Manganese	10	ND		pass
Manganese	MW-31-111904	Manganese	10	ND		pass
	MW-31-050205	Manganese	10	ND		pass
	MW-31-091905	Manganese	10	ND		pass
	MW-31-070104	Mercury	0.2	ND		pass
	MW-31-072804	Mercury	0.2	ND		pass
Mercury	MW-31-111904	Mercury	0.2	ND		pass
	MW-31-050205	Mercury	0.2	ND		pass
	MW-31-091905	Mercury	0.2	ND		pass
	MW-31-070104	Nickel	40	ND		pass
	MW-31-072804	Nickel	40	ND		pass
Nickel	MW-31-111904	Nickel	40	ND		pass
	MW-31-050205	Nickel	40	ND		pass
	MW-31-091905	Nickel	40	ND		pass
	MW-31-070104	Potassium	3000	ND		pass
	MW-31-072804	Potassium	3000	ND		pass
Potassium	MW-31-111904	Potassium	3000	ND		pass
	MW-31-050205	Potassium	3000	ND		pass
	MW-31-091905	Potassium	3000	ND		pass
	MW-31-070104	Selenium	16	ND		pass
	MW-31-072804	Selenium	15	ND		pass
Selenium	MW-31-111904	Selenium	15	ND		pass
	MW-31-050205	Selenium	15	ND		pass
	MW-31-091905	Selenium	15	ND		pass
	MW-31-070104	Silver	10	ND		pass
	MW-31-072804	Silver	10	ND		pass
Silver	MW-31-111904	Silver	10	ND		pass

Table E-3. Data Quality Assessment
Evaluation of Equipment Blank (Rinsate) Samples

B. GROUNDWATER SAMPLING EQUIPMENT RINSATE

Anayte	Sample ID	Anayte	Reporting Limit (ug/L)	Measured Concentration (ug/L)		QC Acceptance Criteria Evaluation
	MW-31-050205	Silver	10	ND		pass
	MW-31-091905	Silver	10	ND		pass
Sodium	MW-31-070104	Sodium	5000	ND		pass
	MW-31-072804	Sodium	5000	ND		pass
	MW-31-111904	Sodium	5000	ND		pass
	MW-31-050205	Sodium	5000	ND		pass
	MW-31-091905	Sodium	5000	ND		pass
Thallium	MW-31-070104	Thallium	1	ND		pass
	MW-31-072804	Thallium	1	ND		pass
	MW-31-111904	Thallium	1	ND		pass
	MW-31-050205	Thallium	1	ND		pass
	MW-31-091905	Thallium	1	ND		pass
Vanadium	MW-31-070104	Vanadium	10	ND		pass
	MW-31-072804	Vanadium	10	ND		pass
	MW-31-111904	Vanadium	10	ND		pass
	MW-31-050205	Vanadium	10	ND		pass
	MW-31-091905	Vanadium	10	ND		pass
Zinc	MW-31-070104	Zinc	20	ND		pass
	MW-31-072804	Zinc	20	ND		pass
	MW-31-111904	Zinc	20	ND	UJ	pass
	MW-31-050205	Zinc	20	ND		pass
	MW-31-091905	Zinc	20	ND		pass

fail = Concentration in rinsate exceeds the QC acceptance criteria (1 x RL). Field sampling-induced contamination may have occurred.

ND = Concentration not detected at concentrations above the reporting limit.

pass = Concentration in rinsate is within acceptance criteria (1 X RL). Does not suggest field sampling-induced contamination has occurred.

QC = *Quality control*

NA = Result could not be evaluated. Data quality not adequate ("R" qualified, or rejected) for evaluation.

Table E-4. Data Quality Assessment
Evaluation of Performance Evaluation (PE) Standard Results

A. SOIL PE STANDARDS

Chemical	PE Sample ID	Nominal Concentration (mg/kg)	Measured Concentration (mg/kg)		Ratio Measured/ Nominal	Acceptance Limits *Confidence Intervals Around the Mean*		QC Acceptance Criteria Evaluation			
						95% CI	99% CI	within 95% CI	within 99% CI	exceed 99% CI	Pass/ Fail
Arsenic	01-VBOU3-SB-0001-A	117	130		1.11	96.3 - 137	89.1 - 144	X	X		pass
	01-VBOU3-SB-0002-E	117	130		1.11	96.3 - 137	89.1 - 144	X	X		pass
	01-VBOU3-SB-0005-D	117	140		1.20	96.3 - 137	89.1 - 144	X	X		pass
	01-VBOU3-SB-0022-E	117	140		1.20	96.3 - 137	89.1 - 144	X	X		pass
	01-VBOU3-SB-0024-C	117	130		1.11	96.3 - 137	89.1 - 144	X	X		pass
Cadmium	01-VBOU3-SB-0001-A	2	2		1.00	1.3 - 2.7	1.1 - 2.9	X	X		pass
	01-VBOU3-SB-0002-E	2	1.8		0.90	1.3 - 2.7	1.1 - 2.9	X	X		pass
	01-VBOU3-SB-0005-D	2	1.9	J	0.95	1.3 - 2.7	1.1 - 2.9	X	X		pass
	01-VBOU3-SB-0022-E	2	2.1		1.05	1.3 - 2.7	1.1 - 2.9	X	X		pass
	01-VBOU3-SB-0024-C	2	1.9		0.95	1.3 - 2.7	1.1 - 2.9	X	X		pass
Lead	01-VBOU3-SB-0001-A	1070	1300		1.21	797 - 1350	701 - 1440	X	X		pass
	01-VBOU3-SB-0002-E	1070	1300		1.21	797 - 1350	701 - 1440	X	X		pass
	01-VBOU3-SB-0005-D	1070	1300	J	1.21	797 - 1350	701 - 1440	X	X		pass
	01-VBOU3-SB-0022-E	1070	1400	J	1.31	797 - 1350	701 - 1440	X	X		pass
	01-VBOU3-SB-0024-C	1070	1400		1.31	797 - 1350	701 - 1440	X	X		pass
Zinc	01-VBOU3-SB-0001-A	1630	1800		1.10	1420 - 1850	1310 - 1960	X	X		pass
	01-VBOU3-SB-0002-E	1630	1700		1.04	1420 - 1850	1310 - 1960	X	X		pass
	01-VBOU3-SB-0005-D	1630	1900		1.17	1420 - 1850	1310 - 1960		X		pass
	01-VBOU3-SB-0022-E	1630	1700	J	1.04	1420 - 1850	1310 - 1960	X	X		pass
	01-VBOU3-SB-0024-C	1630	1900	J	1.17	1420 - 1850	1310 - 1960		X		pass

B. GROUNDWATER PE STANDARDS

Chemical	PE Sample ID	Nominal Concentration (ug/L)	Measured Concentration (ug/L)		Ratio Measured/N ominal	Acceptance Limits *Confidence Intervals Around the Mean*		QC Acceptance Criteria Evaluation			
						95% CI	99% CI	within 95% CI	within 99% CI	exceed 99% CI	Pass/ Fail
Arsenic	01-VBOU3-GW-0005	43	41.4	J	0.96	37.3 - 48.8	34.4 - 51.7	X	X		pass
	MW-30-070104	43	40		0.93	37.3 - 48.8	34.4 - 51.7	X	X		pass
	MW-30-111904	43	43		1.00	37.3 - 48.8	34.4 - 51.7	X	X		pass
	MW-30-050205	43	11	J	0.26	37.3 - 48.8	34.4 - 51.6			x	fail
	MW-30-092005	43	41		0.95	37.3 - 48.8	34.4 - 51.6	X	X		pass
Cadmium	01-VBOU3-GW-0005	25	24.8	J	0.99	21.7 - 26.4	20.1 - 30.1	X	X		pass
	MW-30-070104	25	24		0.96	21.7 - 28.4	20.1 - 30.1	X	X		pass
	MW-30-111904	25	25		1.00	21.7 - 28.4	20.1 - 30.1	X	X		pass
	MW-30-050205	25	6		0.26	20.2 - 26.4	18.7 - 28			x	fail
	MW-30-092005	25	24		0.96	21.7 - 28.4	20.1 - 30.1	X	X		pass
Lead	01-VBOU3-GW-0005	18	19.1	J	1.06	15.6 - 20.4	14 4 - 21.6	X	X		pass
	MW-30-070104	18	18		1.00	15.6 - 20.4	14.4 - 21.6	X	X		pass
	MW-30-111904	18	18		1.00	15.7 - 20.5	14.5 - 21.7	X	X		pass
	MW-30-050205	10	3	U	0.30	N.L. - 13.1	N.L. - 12.4			x	fail
	MW-30-092005	18	17		0.94	15.7 - 20.5	14.5 - 21.7	X	X		pass
Zinc	01-VBOU3-GW-0005	125	130		1.04	103 - 158	92.5 - 168	X	X		pass
	MW-30-070104	125	170		1.36	103 - 158	92.5 - 168			X	fail
	MW-30-111904	131	120	J	0.92	102 - 159	91.9 - 169	X	X		pass
	MW-30-050205	121	30		0.25	104 - 145	96.4 - 137			x	fail
	MW-30-092005	131	110		0.84	102 - 159	91.9 - 169	X	X		pass

fail = Result is outside the acceptance limits (99% Confidence Interval). Analytical accuracy of method may be biased either high or low.

pass = Result is withine the acceptance limits (99% Confidence Interval). Analytical accuracy of method is adequate.

QC = Quality control

N.L. = No lower limit. Result evaluated by comparison to upper limit only (pass = below 95% or 99% CI).

Table E-5. Data Quality Assessment
Evaluation of Matrix Spike (MS) Sample Results

A. SOIL SAMPLES

Sample ID	Anayte	Analyte Type	Field Sample Result (mg/kg)	Spike Amount (mg/kg)	Matrix Spike Result (mg/kg)			Percent Recovery	Lower Limit	Upper Limit	QC Acceptance Criteria Evaluation
01-VBOU3-SB-0004-A	Aluminum	Total	7400	202	11100	mg/kg	NC MSB		50	200	NA
01-VBOU3-SB-0004-A	Antimony	Total	ND	50.5	29.2	mg/kg		56	20	200	pass
01-VBOU3-SB-0004-A	Arsenic	Total	18	202	210	mg/kg		95	76	111	pass
01-VBOU3-SB-0004-A	Barium	Total	160	202	370	mg/kg		106	52	159	pass
01-VBOU3-SB-0004-A	Beryllium	Total	ND	5.05	4.9	mg/kg		90	72	105	pass
01-VBOU3-SB-0004-A	Cadmium	Total	3.2	5.05	9.51	mg/kg		125	40	130	pass
01-VBOU3-SB-0004-A	Calcium	Total	5600	5050	11300	mg/kg		114	43	165	pass
01-VBOU3-SB-0004-A	Chromium	Total	7.6	20.2	29.5	mg/kg		108	70	200	pass
01-VBOU3-SB-0004-A	Cobalt	Total	4.6	50.5	51.7	mg/kg		93	72	106	pass
01-VBOU3-SB-0004-A	Copper	Total	200	25.3	537	mg/kg	NC MSB		37	187	NA
01-VBOU3-SB-0004-A	Iron	Total	10000	101	14000	mg/kg	NC MSB		70	200	NA
01-VBOU3-SB-0004-A	Lead	Total	190	50.5	352	mg/kg	N	315	70	200	fail
01-VBOU3-SB-0004-A	Magnesium	Total	1600	5050	6910	mg/kg		105	64	145	pass
01-VBOU3-SB-0004-A	Manganese	Total	180	50.5	243	mg/kg		129	40	200	pass
01-VBOU3-SB-0004-A	Mercury	Total	0.14	0.833	0.952	mg/kg		98	82	113	pass
01-VBOU3-SB-0004-A	Nickel	Total	7.7	50.5	55.7	mg/kg		95	61	126	pass
01-VBOU3-SB-0004-A	Potassium	Total	1200	5050	6050	mg/kg		97	56	172	pass
01-VBOU3-SB-0004-A	Selenium	Total	ND	202	196	mg/kg		97	76	104	pass
01-VBOU3-SB-0004-A	Silver	Total	2.1	5.05	8.73	mg/kg		131	75	141	pass
01-VBOU3-SB-0004-A	Sodium	Total	ND	5050	5100	mg/kg		95	78	111	pass
01-VBOU3-SB-0004-A	Thallium	Total	ND	202	185	mg/kg		91	87	101	pass
01-VBOU3-SB-0004-A	Vanadium	Total	23	50.5	72.8	mg/kg		99	50	169	pass
01-VBOU3-SB-0004-A	Zinc	Total	210	50.5	424	mg/kg	NC MSB		70	200	NA
01-VBOU3-SB-0007-D	Aluminum	Total	16000	200	25100	mg/kg	NC MSB		50	200	NA
01-VBOU3-SB-0007-D	Antimony	Total	ND	50	20.8	mg/kg		41	20	200	pass
01-VBOU3-SB-0007-D	Arsenic	Total	11	200	211	mg/kg		100	76	111	pass
01-VBOU3-SB-0007-D	Barium	Total	140	200	364	mg/kg		113	52	159	pass
01-VBOU3-SB-0007-D	Beryllium	Total	ND	5	5.17	mg/kg		94	72	105	pass
01-VBOU3-SB-0007-D	Cadmium	Total	510	5	271	mg/kg	NC MSB		40	130	NA
01-VBOU3-SB-0007-D	Calcium	Total	18000	5000	11000	mg/kg	N	0	43	165	fail
01-VBOU3-SB-0007-D	Chromium	Total	11	20	34.7	mg/kg		118	70	200	pass
01-VBOU3-SB-0007-D	Cobalt	Total	5	50	54.6	mg/kg		99	72	106	pass
01-VBOU3-SB-0007-D	Copper	Total	83	25	130	mg/kg	N	190	37	187	fail
01-VBOU3-SB-0007-D	Iron	Total	19000	100	21900	mg/kg	NC MSB		70	200	NA
01-VBOU3-SB-0007-D	Lead	Total	32	50	88.4	mg/kg		114	70	200	pass
01-VBOU3-SB-0007-D	Magnesium	Total	3100	5000	8780	mg/kg		114	64	145	pass
01-VBOU3-SB-0007-D	Manganese	Total	370	50	407	mg/kg	NC MSB		40	200	NA
01-VBOU3-SB-0007-D	Mercury	Total	0.046	0.806	0.8	mg/kg		93	82	113	pass
01-VBOU3-SB-0007-D	Nickel	Total	8.9	50	58.7	mg/kg		100	61	126	pass
01-VBOU3-SB-0007-D	Potassium	Total	2700	5000	8700	mg/kg		120	56	172	pass
01-VBOU3-SB-0007-D	Selenium	Total	ND	200	203	mg/kg		101	76	104	pass
01-VBOU3-SB-0007-D	Silver	Total	1.1	5	6.32	mg/kg		105	75	141	pass
01-VBOU3-SB-0007-D	Sodium	Total	880	5000	5850	mg/kg		100	78	111	pass
01-VBOU3-SB-0007-D	Thallium	Total	ND	200	199	mg/kg		99	87	101	pass
01-VBOU3-SB-0007-D	Vanadium	Total	30	50	90.3	mg/kg		121	50	169	pass
01-VBOU3-SB-0007-D	Zinc	Total	3500	50	3470	mg/kg	NC MSB		70	200	NA
01-VBOU3-SB-0009-C	Mercury	Total	0.036	0	0.88	mg/kg		101	82	113	pass
01-VBOU3-SB-0016-B	Aluminum	Total	31000	198	30800	mg/kg	NC MSB		50	200	NA
01-VBOU3-SB-0016-B	Antimony	Total	ND	49.5	17.4	mg/kg		35	20	200	pass
01-VBOU3-SB-0016-B	Arsenic	Total	22	198	193	mg/kg		86	76	111	pass

Table E-5. Data Quality Assessment
Evaluation of Matrix Spike (MS) Sample Results

A. SOIL SAMPLES

Sample ID	Anayte	Analyte Type	Field Sample Result (mg/kg)		Spike Amount (mg/kg)	Matrix Spike Result (mg/kg)			Percent Recovery	Lower Limit	Upper Limit	QC Acceptance Criteria Evaluation
01-VBOU3-SB-0016-B	Barium	Total	1500		198	1630	mg/kg	NC MSB		52	159	NA
01-VBOU3-SB-0016-B	Beryllium	Total	ND		4.95	4.31	mg/kg		78	72	105	pass
01-VBOU3-SB-0016-B	Cadmium	Total	ND		4.95	4.25	mg/kg		85	40	130	pass
01-VBOU3-SB-0016-B	Calcium	Total	13000		4950	17900	mg/kg		91	43	165	pass
01-VBOU3-SB-0016-B	Chromium	Total	7.6		19.8	23.7	mg/kg		82	70	200	pass
01-VBOU3-SB-0016-B	Cobalt	Total	12		49.5	50.8	mg/kg		79	72	106	pass
01-VBOU3-SB-0016-B	Copper	Total	15		24.8	35.6	mg/kg		85	37	187	pass
01-VBOU3-SB-0016-B	Iron	Total	23000		99	19100	mg/kg	NC MSB		70	200	NA
01-VBOU3-SB-0016-B	Lead	Total	10		49.5	51.9	mg/kg		84	70	200	pass
01-VBOU3-SB-0016-B	Magnesium	Total	4100		4950	8280	mg/kg		84	64	145	pass
01-VBOU3-SB-0016-B	Manganese	Total	380		49.5	340	mg/kg	NC MSB		40	200	NA
01-VBOU3-SB-0016-B	Mercury	Total	ND		0.833	0.516	mg/kg	N	59	82	113	fail
01-VBOU3-SB-0016-B	Nickel	Total	7.3		49.5	46.7	mg/kg		80	61	126	pass
01-VBOU3-SB-0016-B	Potassium	Total	1400		4950	5870	mg/kg		91	56	172	pass
01-VBOU3-SB-0016-B	Selenium	Total	ND		198	182	mg/kg		92	76	104	pass
01-VBOU3-SB-0016-B	Silver	Total	ND		4.95	4.69	mg/kg		85	75	141	pass
01-VBOU3-SB-0016-B	Sodium	Total	2700		4950	7180	mg/kg		90	78	111	pass
01-VBOU3-SB-0016-B	Thallium	Total	ND		198	173	mg/kg		87	87	101	pass
01-VBOU3-SB-0016-B	Vanadium	Total	45		49.5	83.8	mg/kg		79	50	169	pass
01-VBOU3-SB-0016-B	Zinc	Total	54		49.5	83.7	mg/kg	N	60	70	200	fail
01-VBOU3-SB-0018-A	Aluminum	Total	10000		198	15300	mg/kg	NC MSB		50	200	NA
01-VBOU3-SB-0018-A	Antimony	Total	ND		49.5	22.7	mg/kg		46	20	200	pass
01-VBOU3-SB-0018-A	Arsenic	Total	2.6		198	189	mg/kg		94	76	111	pass
01-VBOU3-SB-0018-A	Barium	Total	100		198	307	mg/kg		104	52	159	pass
01-VBOU3-SB-0018-A	Beryllium	Total	ND		4.95	4.65	mg/kg		86	72	105	pass
01-VBOU3-SB-0018-A	Cadmium	Total	ND		4.95	4.6	mg/kg		92	40	130	pass
01-VBOU3-SB-0018-A	Calcium	Total	3200		4950	7980	mg/kg		98	43	165	pass
01-VBOU3-SB-0018-A	Chromium	Total	11		19.8	30.9	mg/kg		102	70	200	pass
01-VBOU3-SB-0018-A	Cobalt	Total	4.8		49.5	49.5	mg/kg		90	72	106	pass
01-VBOU3-SB-0018-A	Copper	Total	130		24.8	72.4	mg/kg	NC MSB		37	187	NA
01-VBOU3-SB-0018-A	Iron	Total	12000		99	13300	mg/kg	NC MSB		70	200	NA
01-VBOU3-SB-0018-A	Lead	Total	44		49.5	76.8	mg/kg	N	66	70	200	fail
01-VBOU3-SB-0018-A	Magnesium	Total	1800		4950	7060	mg/kg		106	64	145	pass
01-VBOU3-SB-0018-A	Manganese	Total	170		49.5	251	mg/kg		174	40	200	pass
01-VBOU3-SB-0018-A	Mercury	Total	ND		0.833	0.769	mg/kg		91	82	113	pass
01-VBOU3-SB-0018-A	Nickel	Total	6.6		49.5	50.6	mg/kg		89	61	126	pass
01-VBOU3-SB-0018-A	Potassium	Total	1900		4950	7510	mg/kg		114	56	172	pass
01-VBOU3-SB-0018-A	Selenium	Total	ND		198	196	mg/kg		99	76	104	pass
01-VBOU3-SB-0018-A	Silver	Total	ND		4.95	4.81	mg/kg		82	75	141	pass
01-VBOU3-SB-0018-A	Sodium	Total	ND		4950	4710	mg/kg		95	78	111	pass
01-VBOU3-SB-0018-A	Thallium	Total	ND		198	184	mg/kg		92	87	101	pass
01-VBOU3-SB-0018-A	Vanadium	Total	22		49.5	70.9	mg/kg		99	50	169	pass
01-VBOU3-SB-0018-A	Zinc	Total	36		49.5	80.7	mg/kg		90	70	200	pass
01-VBOU3-SB-0020-A	Mercury	Total	ND		0.833	0.787	mg/kg		94	82	113	pass
01-VBOU3-SB-0023-A	Aluminum	Total	17000		200	29400	mg/kg	NC MSB		50	200	NA
01-VBOU3-SB-0023-A	Antimony	Total	ND		50	19.2	mg/kg		38	20	200	pass
01-VBOU3-SB-0023-A	Arsenic	Total	3.5		200	194	mg/kg		95	76	111	pass
01-VBOU3-SB-0023-A	Barium	Total	83		200	299	mg/kg		108	52	159	pass
01-VBOU3-SB-0023-A	Beryllium	Total	ND		5	5.17	mg/kg		94	72	105	pass
01-VBOU3-SB-0023-A	Cadmium	Total	ND		5	4.68	mg/kg		94	40	130	pass

Table E-5. Data Quality Assessment
Evaluation of Matrix Spike (MS) Sample Results

A. SOIL SAMPLES

Sample ID	Anayte	Analyte Type	Field Sample Result (mg/kg)		Spike Amount (mg/kg)	Matrix Spike Result (mg/kg)			Percent Recovery	Lower Limit	Upper Limit	QC Acceptance Criteria Evaluation
01-VBOU3-SB-0023-A	Calcium	Total	6600		5000	12000	mg/kg		109	43	165	pass
01-VBOU3-SB-0023-A	Chromium	Total	13		20	37.7	mg/kg		124	70	200	pass
01-VBOU3-SB-0023-A	Cobalt	Total	5.6		50	53.5	mg/kg		96	72	106	pass
01-VBOU3-SB-0023-A	Copper	Total	30		25	53.3	mg/kg		93	37	187	pass
01-VBOU3-SB-0023-A	Iron	Total	17000		100	19600	mg/kg	NC MSB		70	200	NA
01-VBOU3-SB-0023-A	Lead	Total	35		50	83.4	mg/kg		96	70	200	pass
01-VBOU3-SB-0023-A	Magnesium	Total	3000		5000	8810	mg/kg		117	64	145	pass
01-VBOU3-SB-0023-A	Manganese	Total	270		50	342	mg/kg	NC MSB		40	200	NA
01-VBOU3-SB-0023-A	Mercury	Total	ND		0.833	0.765	mg/kg		88	82	113	pass
01-VBOU3-SB-0023-A	Nickel	Total	9.9		50	58.6	mg/kg		97	61	126	pass
01-VBOU3-SB-0023-A	Potassium	Total	2000		5000	7350	mg/kg		108	56	172	pass
01-VBOU3-SB-0023-A	Selenium	Total	ND		200	199	mg/kg		99	76	104	pass
01-VBOU3-SB-0023-A	Silver	Total	ND		5	5.24	mg/kg		97	75	141	pass
01-VBOU3-SB-0023-A	Sodium	Total	520		5000	5110	mg/kg		92	78	111	pass
01-VBOU3-SB-0023-A	Thallium	Total	ND		200	189	mg/kg		94	87	101	pass
01-VBOU3-SB-0023-A	Vanadium	Total	30		50	94.1	mg/kg		127	50	169	pass
01-VBOU3-SB-0023-A	Zinc	Total	93		50	135	mg/kg		84	70	200	pass
01-VBOU3-SB-0026-B	Aluminum	Total	25000		202	30100	mg/kg	NC MSB		50	200	NA
01-VBOU3-SB-0026-B	Antimony	Total	ND		50.5	16.9	mg/kg		33	20	200	pass
01-VBOU3-SB-0026-B	Arsenic	Total	4.1		202	187	mg/kg		91	76	111	pass
01-VBOU3-SB-0026-B	Barium	Total	110		202	337	mg/kg		112	52	159	pass
01-VBOU3-SB-0026-B	Beryllium	Total	1		5.05	5.5	mg/kg		89	72	105	pass
01-VBOU3-SB-0026-B	Cadmium	Total	ND		5.05	5.57	mg/kg		110	40	130	pass
01-VBOU3-SB-0026-B	Calcium	Total	7000		5050	10500	mg/kg		69	43	165	pass
01-VBOU3-SB-0026-B	Chromium	Total	13		20.2	34.7	mg/kg		110	70	200	pass
01-VBOU3-SB-0026-B	Cobalt	Total	7.1		50.5	55.7	mg/kg		96	72	106	pass
01-VBOU3-SB-0026-B	Copper	Total	19		25.3	46.1	mg/kg		106	37	187	pass
01-VBOU3-SB-0026-B	Iron	Total	24000		101	22100	mg/kg	NC MSB		70	200	NA
01-VBOU3-SB-0026-B	Lead	Total	50		50.5	110	mg/kg		120	70	200	pass
01-VBOU3-SB-0026-B	Magnesium	Total	3700		5050	8670	mg/kg		99	64	145	pass
01-VBOU3-SB-0026-B	Manganese	Total	520		50.5	603	mg/kg	NC MSB		40	200	NA
01-VBOU3-SB-0026-B	Mercury	Total	0.039		0.833	0.802	mg/kg		92	82	113	pass
01-VBOU3-SB-0026-B	Nickel	Total	9.1		50.5	56.6	mg/kg		94	61	126	pass
01-VBOU3-SB-0026-B	Potassium	Total	2100		5050	6950	mg/kg		97	56	172	pass
01-VBOU3-SB-0026-B	Selenium	Total	ND		202	188	mg/kg		93	76	104	pass
01-VBOU3-SB-0026-B	Silver	Total	ND		5.05	5.11	mg/kg		96	75	141	pass
01-VBOU3-SB-0026-B	Sodium	Total	790		5050	5160	mg/kg		87	78	111	pass
01-VBOU3-SB-0026-B	Thallium	Total	ND		202	180	mg/kg		89	87	101	pass
01-VBOU3-SB-0026-B	Vanadium	Total	35		50.5	89.2	mg/kg		108	50	169	pass
01-VBOU3-SB-0026-B	Zinc	Total	87		50.5	149	mg/kg		122	70	200	pass
01-VBOU3-SB-0027-B	Aluminum	Total	28000		198	36000	mg/kg	NC MSB		50	200	NA
01-VBOU3-SB-0027-B	Antimony	Total	ND		49.5	17.3	mg/kg		35	20	200	pass
01-VBOU3-SB-0027-B	Arsenic	Total	10		198	208	mg/kg		100	76	111	pass
01-VBOU3-SB-0027-B	Barium	Total	280		198	456	mg/kg		89	52	159	pass
01-VBOU3-SB-0027-B	Beryllium	Total	0.75		4.95	5.37	mg/kg		93	72	105	pass
01-VBOU3-SB-0027-B	Cadmium	Total	ND		4.95	5.27	mg/kg		98	40	130	pass
01-VBOU3-SB-0027-B	Calcium	Total	14000		4950	18600	mg/kg		86	43	165	pass

Table E-5. Data Quality Assessment
Evaluation of Matrix Spike (MS) Sample Results

A. SOIL SAMPLES

Sample ID	Anayte	Analyte Type	Field Sample Result (mg/kg)		Spike Amount (mg/kg)	Matrix Spike Result (mg/kg)			Percent Recovery	Lower Limit	Upper Limit	QC Acceptance Criteria Evaluation
01-VBOU3-SB-0027-B	Chromium	Total	13		19.8	34	mg/kg		105	70	200	pass
01-VBOU3-SB-0027-B	Cobalt	Total	12		49.5	59.6	mg/kg		95	72	106	pass
01-VBOU3-SB-0027-B	Copper	Total	66		24.8	90.6	mg/kg		100	37	187	pass
01-VBOU3-SB-0027-B	Iron	Total	27000		99	26500	mg/kg	NC MSB		70	200	NA
01-VBOU3-SB-0027-B	Lead	Total	40		49.5	93.5	mg/kg		108	70	200	pass
01-VBOU3-SB-0027-B	Magnesium	Total	4800		4950	9790	mg/kg		102	64	145	pass
01-VBOU3-SB-0027-B	Manganese	Total	650		49.5	458	mg/kg	NC MSB		40	200	NA
01-VBOU3-SB-0027-B	Mercury	Total	0.077		0	0.886	mg/kg		94	82	113	pass
01-VBOU3-SB-0027-B	Nickel	Total	13		49.5	57.4	mg/kg		90	61	126	pass
01-VBOU3-SB-0027-B	Potassium	Total	2300		4950	7750	mg/kg		110	56	172	pass
01-VBOU3-SB-0027-B	Selenium	Total	ND		198	202	mg/kg		102	76	104	pass
01-VBOU3-SB-0027-B	Silver	Total	1.1		4.95	5.87	mg/kg		96	75	141	pass
01-VBOU3-SB-0027-B	Sodium	Total	1000		4950	5790	mg/kg		96	78	111	pass
01-VBOU3-SB-0027-B	Thallium	Total	ND		198	191	mg/kg		96	87	101	pass
01-VBOU3-SB-0027-B	Vanadium	Total	54		49.5	104	mg/kg		102	50	169	pass
01-VBOU3-SB-0027-B	Zinc	Total	130		49.5	166	mg/kg	N	65	70	200	**fail**
01-VBOU3-SB-0028-A	Mercury	Total	ND		0.833	0.653	mg/kg	N	76	82	113	**fail**

Fail = Percent recovery does not meet QC acceptance criteria (recoveries are outside of documented historical lab acceptance limits for a chemical).

N = Percent recoveries outside QC control limits.

NC MSB = Not calculated. Parent sample concentrations greater than four times the spiked amounts.

NA = QC acceptance criteria not evaluated. Percent recovery not available for analyte.

Pass = Percent recovery within QC acceptance criteria (recoveries are within documented historical lab acceptance limits for a chemical).

QC = Quality Control

Table E-5. Data Quality Assessment
Evaluation of Matrix Spike (MS) Sample Results

B. GROUNDWATER SAMPLES

Sample ID	Anayte	Analyte Type	Field Sample Result (ug/L)		Spike Amount (ug/L)	Matrix Spike Result (ug/L)			Percent Recovery	Lower Limit	Upper Limit	QC Acceptance Criteria Evaluation
01-VBOU3-RIN-0002	Aluminum	Total	210		2000	2490	ug/L		114	83	119	pass
01-VBOU3-RIN-0002	Antimony	Total	ND		40	42	ug/L		105	89	109	pass
01-VBOU3-RIN-0002	Arsenic	Total	ND		40	39.6	ug/L		99	87	109	pass
01-VBOU3-RIN-0002	Barium	Total	ND		2000	2110	ug/L		105	85	120	pass
01-VBOU3-RIN-0002	Beryllium	Total	ND		40	38.1	ug/L		95	86	115	pass
01-VBOU3-RIN-0002	Cadmium	Total	ND		40	40.4	ug/L		101	89	110	pass
01-VBOU3-RIN-0002	Calcium	Total	240		50000	49800	ug/L		99	48	153	pass
01-VBOU3-RIN-0002	Chromium	Total	ND		200	216	ug/L		107	73	135	pass
01-VBOU3-RIN-0002	Cobalt	Total	ND		500	514	ug/L		103	82	119	pass
01-VBOU3-RIN-0002	Copper	Total	ND		250	253	ug/L		100	82	129	pass
01-VBOU3-RIN-0002	Iron	Total	420		1000	1510	ug/L		108	52	155	pass
01-VBOU3-RIN-0002	Lead	Total	ND		500	513	ug/L		102	89	121	pass
01-VBOU3-RIN-0002	Magnesium	Total	ND		50000	50200	ug/L		100	62	146	pass
01-VBOU3-RIN-0002	Manganese	Total	ND		500	539	ug/L		106	79	121	pass
01-VBOU3-RIN-0002	Nickel	Total	ND		500	516	ug/L		103	84	120	pass
01-VBOU3-RIN-0002	Potassium	Total	ND		50000	48300	ug/L		97	76	132	pass
01-VBOU3-RIN-0002	Selenium	Total	ND		2000	1970	ug/L		99	71	140	pass
01-VBOU3-RIN-0002	Silver	Total	ND		50	49.3	ug/L		99	75	141	pass
01-VBOU3-RIN-0002	Sodium	Total	ND		50000	48600	ug/L		97	70	203	pass
01-VBOU3-RIN-0002	Thallium	Total	ND		40	43.3	ug/L		108	84	120	pass
01-VBOU3-RIN-0002	Vanadium	Total	ND		500	537	ug/L		107	85	120	pass
01-VBOU3-RIN-0002	Zinc	Total	ND		500	487	ug/L		96	60	137	pass
01-VBOU3-RIN-0003	Aluminum	Total	ND		2000	2090	ug/L		101	83	119	pass
01-VBOU3-RIN-0003	Antimony	Total	ND		40	42	ug/L		104	89	109	pass
01-VBOU3-RIN-0003	Arsenic	Total	ND		40	39.3	ug/L		98	87	109	pass
01-VBOU3-RIN-0003	Barium	Total	ND		2000	2120	ug/L		106	85	120	pass
01-VBOU3-RIN-0003	Beryllium	Total	ND		40	42.3	ug/L		106	86	115	pass
01-VBOU3-RIN-0003	Cadmium	Total	ND		40	40.5	ug/L		101	89	110	pass
01-VBOU3-RIN-0003	Calcium	Total	520		50000	50700	ug/L		100	48	153	pass
01-VBOU3-RIN-0003	Chromium	Total	ND		200	214	ug/L		106	73	135	pass
01-VBOU3-RIN-0003	Cobalt	Total	ND		500	514	ug/L		103	82	119	pass
01-VBOU3-RIN-0003	Copper	Total	ND		250	252	ug/L		101	82	129	pass
01-VBOU3-RIN-0003	Iron	Total	170		1000	1180	ug/L		101	52	155	pass
01-VBOU3-RIN-0003	Lead	Total	ND		500	526	ug/L		105	89	121	pass
01-VBOU3-RIN-0003	Magnesium	Total	200		50000	51500	ug/L		103	62	146	pass
01-VBOU3-RIN-0003	Manganese	Total	ND		500	523	ug/L		104	79	121	pass
01-VBOU3-RIN-0003	Nickel	Total	ND		500	518	ug/L		103	84	120	pass
01-VBOU3-RIN-0003	Potassium	Total	ND		50000	51100	ug/L		102	76	132	pass
01-VBOU3-RIN-0003	Selenium	Total	ND		2000	2070	ug/L		104	71	140	pass
01-VBOU3-RIN-0003	Silver	Total	ND		50	49.5	ug/L		98	75	141	pass
01-VBOU3-RIN-0003	Sodium	Total	ND		50000	49700	ug/L		99	70	203	pass
01-VBOU3-RIN-0003	Thallium	Total	ND		40	41.7	ug/L		104	84	120	pass
01-VBOU3-RIN-0003	Vanadium	Total	ND		500	535	ug/L		107	85	120	pass
01-VBOU3-RIN-0003	Zinc	Total	ND		500	501	ug/L		99	60	137	pass

Table E-5. Data Quality Assessment
Evaluation of Matrix Spike (MS) Sample Results

B. GROUNDWATER SAMPLES

Sample ID	Anayte	Analyte Type	Field Sample Result (ug/L)		Spike Amount (ug/L)	Matrix Spike Result (ug/L)			Percent Recovery	Lower Limit	Upper Limit	QC Acceptance Criteria Evaluation
MW-31-072804	Antimony	Total	ND		40	39.7	ug/L		99	89	109	pass
MW-31-072804	Arsenic	Total	ND		40	38.1	ug/L		95	87	109	pass
MW-31-072804	Beryllium	Total	ND		40	43.3	ug/L		108	86	115	pass
MW-31-072804	Cadmium	Total	ND		40	39.6	ug/L		99	89	110	pass
MW-31-072804	Thallium	Total	ND		40	43 6	ug/L		109	84	120	pass
MW-33-050304	Aluminum	Total	26000		2000	46400	ug/L	NC MSB		83	119	NA
MW-33-050304	Antimony	Total	ND		40	13.2	ug/L	N	33	89	109	**fail**
MW-33-050304	Antimony	Dissolved	ND		40	41.8	ug/L		104	80	117	pass
MW-33-050304	Arsenic	Total	7.1		40	47.3	ug/L		101	87	109	pass
MW-33-050304	Arsenic	Dissolved	2		40	44	ug/L		105	79	120	pass
MW-33-050304	Barium	Total	220		2000	2300	ug/L		104	85	120	pass
MW-33-050304	Beryllium	Total	1.6		40	41 7	ug/L		100	86	115	pass
MW-33-050304	Beryllium	Dissolved	ND		40	45.3	ug/L		113	76	126	pass
MW-33-050304	Cadmium	Total	87		40	129	ug/L		105	89	110	pass
MW-33-050304	Cadmium	Dissolved	69		40	110	ug/L		103	82	115	pass
MW-33-050304	Calcium	Total	77000		50000	125000	ug/L		96	48	153	pass
MW-33-050304	Chromium	Total	26		200	222	ug/L		98	73	135	pass
MW-33-050304	Cobalt	Total	64		500	526	ug/L		92	82	119	pass
MW-33-050304	Copper	Total	96		250	346	ug/L		100	82	129	pass
MW-33-050304	Iron	Total	28000		1000	32300	ug/L	NC MSB		52	155	NA
MW-33-050304	Lead	Total	26		500	495	ug/L		94	89	121	pass
MW-33-050304	Magnesium	Total	11000		50000	63400	ug/L		104	62	146	pass
MW-33-050304	Manganese	Total	1300		500	1770	ug/L		88	79	121	pass
MW-33-050304	Nickel	Total	46		500	517	ug/L		94	84	120	pass
MW-33-050304	Potassium	Total	6500		50000	58400	ug/L		104	76	132	pass
MW-33-050304	Selenium	Total	ND		2000	1890	ug/L		95	71	140	pass
MW-33-050304	Silver	Total	ND		50	50	ug/L		98	75	141	pass
MW-33-050304	Sodium	Total	100000		50000	148000	ug/L		96	70	203	pass
MW-33-050304	Thallium	Total	ND		40	43.4	ug/L		106	84	120	pass
MW-33-050304	Thallium	Dissolved	ND		40	41.5	ug/L		104	77	124	pass
MW-33-050304	Vanadium	Total	38		500	531	ug/L		99	85	120	pass
MW-33-050304	Zinc	Total	940		500	1380	ug/L		88	60	137	pass
MW-33-052104	Aluminum	Total	580		2000	3240	ug/L	N	133	83	119	**fail**
MW-33-052104	Antimony	Dissolved	ND		40	40	ug/L		99	80	117	pass
MW-33-052104	Arsenic	Dissolved	2		40	42.8	ug/L		102	79	120	pass
MW-33-052104	Barium	Total	29		2000	2110	ug/L		104	85	120	pass
MW-33-052104	Beryllium	Dissolved	ND		40	45.1	ug/L		113	76	126	pass
MW-33-052104	Cadmium	Dissolved	40		40	80	ug/L		100	82	115	pass
MW-33-052104	Calcium	Total	66000		50000	117000	ug/L		101	48	153	pass
MW-33-052104	Chromium	Total	ND		200	192	ug/L		96	73	135	pass
MW-33-052104	Cobalt	Total	ND		500	471	ug/L		94	82	119	pass
MW-33-052104	Copper	Total	ND		250	270	ug/L		104	82	129	pass
MW-33-052104	Iron	Total	560		1000	1690	ug/L		113	52	155	pass
MW-33-052104	Lead	Total	ND		500	479	ug/L		96	89	121	pass
MW-33-052104	Magnesium	Total	6700		50000	59200	ug/L		105	62	146	pass
MW-33-052104	Manganese	Total	51		500	538	ug/L		97	79	121	pass
MW-33-052104	Mercury	Total	ND		5	5.04	ug/L		100	84	114	pass
MW-33-052104	Nickel	Total	ND		500	466	ug/L		91	84	120	pass
MW-33-052104	Potassium	Total	ND		50000	53900	ug/L		103	76	132	pass
MW-33-052104	Selenium	Total	ND		2000	2000	ug/L		100	71	140	pass

Table E-5. Data Quality Assessment
Evaluation of Matrix Spike (MS) Sample Results

B. GROUNDWATER SAMPLES

Sample ID	Anayte	Analyte Type	Field Sample Result (ug/L)		Spike Amount (ug/L)	Matrix Spike Result (ug/L)			Percent Recovery	Lower Limit	Upper Limit	QC Acceptance Criteria Evaluation
MW-33-052104	Silver	Total	ND		50	49.7	ug/L		98	75	141	pass
MW-33-052104	Sodium	Total	82000		50000	134000	ug/L		104	70	203	pass
MW-33-052104	Thallium	Dissolved	ND		40	41.3	ug/L		103	77	124	pass
MW-33-052104	Vanadium	Total	ND		500	492	ug/L		98	85	120	pass
MW-33-052104	Zinc	Total	190		500	642	ug/L		91	60	137	pass
MW-33-070104	Aluminum	Total	420		2000	2820	ug/L	N	120	83	119	fail
MW-33-070104	Aluminum	Dissolved	ND		2000	2020	ug/L		101	83	119	pass
MW-33-070104	Antimony	Dissolved	ND		40	40.7	ug/L		100	80	117	pass
MW-33-070104	Antimony	Total	ND		40	41.4	ug/L		103	89	109	pass
MW-33-070104	Arsenic	Dissolved	2.8		40	42	ug/L		98	79	120	pass
MW-33-070104	Arsenic	Total	3.1		40	43	ug/L		100	87	109	pass
MW-33-070104	Barium	Total	30		2000	2170	ug/L		107	85	120	pass
MW-33-070104	Barium	Dissolved	26		2000	2080	ug/L		103	85	120	pass
MW-33-070104	Beryllium	Dissolved	ND		40	41.8	ug/L		104	76	126	pass
MW-33-070104	Beryllium	Total	ND		40	42.7	ug/L		106	86	115	pass
MW-33-070104	Cadmium	Dissolved	26		40	64.4	ug/L		96	82	115	pass
MW-33-070104	Cadmium	Total	27		40	66.2	ug/L		98	89	110	pass
MW-33-070104	Calcium	Total	75000		50000	126000	ug/L		102	48	153	pass
MW-33-070104	Calcium	Dissolved	73000		50000	121000	ug/L		97	48	153	pass
MW-33-070104	Chromium	Total	ND		200	214	ug/L		106	73	135	pass
MW-33-070104	Chromium	Dissolved	ND		200	206	ug/L		103	73	135	pass
MW-33-070104	Cobalt	Total	ND		500	520	ug/L		104	82	119	pass
MW-33-070104	Cobalt	Dissolved	ND		500	511	ug/L		100	82	119	pass
MW-33-070104	Copper	Total	ND		250	269	ug/L		104	82	129	pass
MW-33-070104	Copper	Dissolved	ND		250	257	ug/L		100	82	129	pass
MW-33-070104	Iron	Total	330		1000	1390	ug/L		106	52	155	pass
MW-33-070104	Iron	Dissolved	ND		1000	974	ug/L		97	52	155	pass
MW-33-070104	Lead	Total	ND		500	522	ug/L		104	89	121	pass
MW-33-070104	Lead	Dissolved	ND		500	507	ug/L		101	89	121	pass
MW-33-070104	Magnesium	Total	7300		50000	59300	ug/L		104	62	146	pass
MW-33-070104	Magnesium	Dissolved	7000		50000	56500	ug/L		99	62	146	pass
MW-33-070104	Manganese	Total	32		500	562	ug/L		106	79	121	pass
MW-33-070104	Manganese	Dissolved	15		500	530	ug/L		103	79	121	pass
MW-33-070104	Mercury	Dissolved	ND		5	5.28	ug/L		105	84	114	pass
MW-33-070104	Mercury	Total	ND		5	4.82	ug/L		95	84	114	pass
MW-33-070104	Nickel	Total	ND		500	531	ug/L		105	84	120	pass
MW-33-070104	Nickel	Dissolved	ND		500	510	ug/L		100	84	120	pass
MW-33-070104	Potassium	Total	ND		50000	55000	ug/L		106	76	132	pass
MW-33-070104	Potassium	Dissolved	ND		50000	51600	ug/L		98	76	132	pass
MW-33-070104	Selenium	Total	ND		2000	2030	ug/L		102	71	140	pass
MW-33-070104	Selenium	Dissolved	ND		2000	2000	ug/L		100	71	140	pass
MW-33-070104	Silver	Total	ND		50	55.4	ug/L		111	75	141	pass
MW-33-070104	Silver	Dissolved	ND		50	53.7	ug/L		107	75	141	pass
MW-33-070104	Sodium	Total	93000		50000	145000	ug/L		105	70	203	pass
MW-33-070104	Sodium	Dissolved	92000		50000	140000	ug/L		97	70	203	pass
MW-33-070104	Thallium	Dissolved	ND		40	37.6	ug/L		94	77	124	pass
MW-33-070104	Thallium	Total	ND		40	38.3	ug/L		96	84	120	pass
MW-33-070104	Vanadium	Total	ND		500	532	ug/L		106	85	120	pass
MW-33-070104	Vanadium	Dissolved	ND		500	513	ug/L		102	85	120	pass
MW-33-070104	Zinc	Total	220		500	707	ug/L		98	60	137	pass
MW-33-070104	Zinc	Dissolved	200		500	664	ug/L		93	60	137	pass

Table E-5. Data Quality Assessment
Evaluation of Matrix Spike (MS) Sample Results

B. GROUNDWATER SAMPLES

Sample ID	Anayte	Analyte Type	Field Sample Result (ug/L)		Spike Amount (ug/L)	Matrix Spike Result (ug/L)			Percent Recovery	Lower Limit	Upper Limit	QC Acceptance Criteria Evaluation
MW-33-072804	Aluminum	Total	110		2000	2200	ug/L		104	83	119	pass
MW-33-072804	Barium	Total	34		2000	2020	ug/L		99	85	120	pass
MW-33-072804	Calcium	Total	100000		50000	153000	ug/L		106	48	153	pass
MW-33-072804	Chromium	Total	ND		200	214	ug/L		106	73	135	pass
MW-33-072804	Cobalt	Total	ND		500	523	ug/L		104	82	119	pass
MW-33-072804	Copper	Total	ND		250	253	ug/L		98	82	129	pass
MW-33-072804	Iron	Total	170		1000	1200	ug/L		103	52	155	pass
MW-33-072804	Lead	Total	ND		500	523	ug/L		104	89	121	pass
MW-33-072804	Magnesium	Total	9800		50000	62700	ug/L		106	62	146	pass
MW-33-072804	Manganese	Total	23		500	547	ug/L		105	79	121	pass
MW-33-072804	Nickel	Total	ND		500	528	ug/L		104	84	120	pass
MW-33-072804	Potassium	Total	ND		50000	54600	ug/L		104	76	132	pass
MW-33-072804	Selenium	Total	ND		2000	2080	ug/L		104	71	140	pass
MW-33-072804	Silver	Total	ND		50	52	ug/L		103	75	141	pass
MW-33-072804	Sodium	Total	120000		50000	172000	ug/L		112	70	203	pass
MW-33-072804	Vanadium	Total	ND		500	524	ug/L		105	85	120	pass
MW-33-072804	Zinc	Total	250		500	745	ug/L		98	60	137	pass
MW-34-052104	Aluminum	Dissolved	ND		2000	2180	ug/L		109	83	119	pass
MW-34-052104	Barium	Dissolved	62		2000	2090	ug/L		101	85	120	pass
MW-34-052104	Calcium	Dissolved	630000		50000	664000	ug/L	NC MSB		48	153	NA
MW-34-052104	Chromium	Dissolved	ND		200	186	ug/L		93	73	135	pass
MW-34-052104	Cobalt	Dissolved	ND		500	469	ug/L		93	82	119	pass
MW-34-052104	Copper	Dissolved	11		250	283	ug/L		109	82	129	pass
MW-34-052104	Iron	Dissolved	180		1000	1200	ug/L		102	52	155	pass
MW-34-052104	Lead	Dissolved	ND		500	484	ug/L		97	89	121	pass
MW-34-052104	Magnesium	Dissolved	57000		50000	109000	ug/L		104	62	146	pass
MW-34-052104	Manganese	Dissolved	640		500	1090	ug/L		91	79	121	pass
MW-34-052104	Nickel	Dissolved	ND		500	474	ug/L		89	84	120	pass
MW-34-052104	Potassium	Dissolved	12000		50000	67700	ug/L		111	76	132	pass
MW-34-052104	Selenium	Dissolved	ND		2000	2160	ug/L		108	71	140	pass
MW-34-052104	Silver	Dissolved	ND		50	53.7	ug/L		106	75	141	pass
MW-34-052104	Sodium	Dissolved	680000		50000	718000	ug/L	NC MSB		70	203	NA
MW-34-052104	Vanadium	Dissolved	ND		500	477	ug/L		95	85	120	pass
MW-34-052104	Zinc	Dissolved	45		500	515	ug/L		94	60	137	pass
KP-GW-16-111904	Aluminum	Dissolved	ND		2000	2150	ug/L		104	83	119	pass
KP-GW-16-111904	Antimony	Dissolved	ND		40	41.8	ug/L		104	80	117	pass
KP-GW-16-111904	Arsenic	Dissolved	ND		40	43.9	ug/L		109	79	120	pass
KP-GW-16-111904	Barium	Dissolved	71		2000	2130	ug/L		103	85	120	pass
KP-GW-16-111904	Beryllium	Dissolved	ND		40	42.6	ug/L		106	76	126	pass
KP-GW-16-111904	Cadmium	Dissolved	50		40	90	ug/L		100	82	115	pass
KP-GW-16-111904	Calcium	Dissolved	230000		50000	281000	ug/L			48	153	NA
KP-GW-16-111904	Chromium	Dissolved	ND		200	198	ug/L		99	73	135	pass
KP-GW-16-111904	Cobalt	Dissolved	ND		500	489	ug/L		97	82	119	pass
KP-GW-16-111904	Copper	Dissolved	ND		250	262	ug/L		104	82	129	pass
KP-GW-16-111904	Iron	Dissolved	120		1000	1110	ug/L		100	52	155	pass
KP-GW-16-111904	Lead	Dissolved	ND		500	510	ug/L		102	89	121	pass
KP-GW-16-111904	Magnesium	Dissolved	37000		50000	90600	ug/L		107	62	146	pass
KP-GW-16-111904	Manganese	Dissolved	330		500	822	ug/L		98	79	121	pass
KP-GW-16-111904	Mercury	Dissolved	ND		5	5.46	ug/L		109	85	114	pass
KP-GW-16-111904	Nickel	Dissolved	ND		500	497	ug/L		98	84	120	pass
KP-GW-16-111904	Potassium	Dissolved	8200		50000	64400	ug/L		112	76	132	pass
KP-GW-16-111904	Selenium	Dissolved	ND		2000	2110	ug/L		106	71	140	pass

Table E-5. Data Quality Assessment
Evaluation of Matrix Spike (MS) Sample Results

B. GROUNDWATER SAMPLES

Sample ID	Anayte	Analyte Type	Field Sample Result (ug/L)		Spike Amount (ug/L)	Matrix Spike Result (ug/L)			Percent Recovery	Lower Limit	Upper Limit	QC Acceptance Criteria Evaluation
KP-GW-16-111904	Silver	Dissolved	ND		50	54.1	ug/L		108	75	141	pass
KP-GW-16-111904	Sodium	Dissolved	260000		50000	306000	ug/L			70	203	NA
KP-GW-16-111904	Thallium	Dissolved	ND		40	40.1	ug/L		100	77	124	pass
KP-GW-16-111904	Vanadium	Dissolved	ND		500	500	ug/L		100	85	120	pass
KP-GW-16-111904	Zinc	Dissolved	150		500	657	ug/L		101	60	137	pass
KP-GW-16-111904	Aluminum	Total	220	J	2000	2500	ug/L		114	83	119	pass
KP-GW-16-111904	Barium	Total	74		2000	2070	ug/L		100	85	120	pass
KP-GW-16-111904	Calcium	Total	230000		50000	292000	ug/L	NC MSB		48	153	NA
KP-GW-16-111904	Chromium	Total	ND		200	189	ug/L		94	73	135	pass
KP-GW-16-111904	Cobalt	Total	ND		500	466	ug/L		93	82	119	pass
KP-GW-16-111904	Copper	Total	ND		250	260	ug/L		103	82	129	pass
KP-GW-16-111904	Iron	Total	240		1000	1330	ug/L		110	52	155	pass
KP-GW-16-111904	Lead	Total	ND		500	485	ug/L		97	89	121	pass
KP-GW-16-111904	Magnesium	Total	36000		50000	94300	ug/L		116	62	146	pass
KP-GW-16-111904	Manganese	Total	490		500	989	ug/L		99	79	121	pass
KP-GW-16-111904	Mercury	Total	ND		5	5.14	ug/L		101	85	114	pass
KP-GW-16-111904	Nickel	Total	ND		500	475	ug/L		94	84	120	pass
KP-GW-16-111904	Potassium	Total	7800		50000	64400	ug/L		113	76	132	pass
KP-GW-16-111904	Selenium	Total	ND		2000	2020	ug/L		101	71	140	pass
KP-GW-16-111904	Silver	Total	ND		50	52.3	ug/L		104	75	141	pass
KP-GW-16-111904	Sodium	Total	250000		50000	318000	ug/L	NC MSB		70	203	NA
KP-GW-16-111904	Vanadium	Total	ND		500	487	ug/L		97	85	120	pass
KP-GW-16-111904	Zinc	Total	150	J	500	595	ug/L		89	60	137	pass
KP-GW-46-111904A	Antimony	Total	ND		40	44.6	ug/L		111	89	109	fail
KP-GW-46-111904A	Arsenic	Total	ND		40	44.2	ug/L		109	87	109	pass
KP-GW-46-111904A	Beryllium	Total	ND		40	48	ug/L		120	86	115	fail
KP-GW-46-111904A	Cadmium	Total	23		40	63	ug/L		100	89	110	pass
KP-GW-46-111904A	Thallium	Total	ND		40	41.9	ug/L		104	84	120	pass
KP-SW-1-032805	Aluminum	Total	ND		2000	2110	ug/L		104	83	119	pass
KP-SW-1-032805	Barium	Total	34		2000	2080	ug/L		102	85	120	pass
KP-SW-1-032805	Calcium	Total	70000		50000	123000	ug/L		106	48	153	pass
KP-SW-1-032805	Chromium	Total	ND		200	205	ug/L		101	73	135	pass
KP-SW-1-032805	Cobalt	Total	ND		500	498	ug/L		100	82	119	pass
KP-SW-1-032805	Copper	Total	ND		250	252	ug/L		101	82	129	pass
KP-SW-1-032805	Iron	Total	150		1000	1120	ug/L		97	52	155	pass
KP-SW-1-032805	Lead	Total	ND		500	497	ug/L		99	89	121	pass
KP-SW-1-032805	Magnesium	Total	12000		50000	63200	ug/L		102	62	146	pass
KP-SW-1-032805	Manganese	Total	ND		500	500	ug/L		100	79	121	pass
KP-SW-1-032805	Nickel	Total	ND		500	501	ug/L		99	84	120	pass
KP-SW-1-032805	Potassium	Total	ND		50000	52000	ug/L		99	76	132	pass
KP-SW-1-032805	Selenium	Total	ND		2000	2060	ug/L		102	71	140	pass
KP-SW-1-032805	Silver	Total	ND		50	53.2	ug/L		103	75	141	pass
KP-SW-1-032805	Sodium	Total	170000		50000	224000	ug/L		109	70	203	pass
KP-SW-1-032805	Vanadium	Total	ND		500	516	ug/L		103	85	120	pass
KP-SW-1-032805	Zinc	Total	22		500	512	ug/L		98	60	137	pass
KP-SW-2-032805	Antimony	Total	ND		40	41.6	ug/L		103	89	109	pass
KP-SW-2-032805	Arsenic	Total	1		40	41.5	ug/L		101	87	109	pass
KP-SW-2-032805	Beryllium	Total	ND		40	40.5	ug/L		101	86	115	pass
KP-SW-2-032805	Cadmium	Total	4.6		40	45.1	ug/L		101	89	110	pass
KP-SW-2-032805	Thallium	Total	ND		40	40.8	ug/L		102	84	120	pass
PS-1-050205	Aluminum	Dissolved	190		2000	2310	ug/L		106	83	119	pass
PS-1-050205	Antimony	Dissolved	ND		40	42.2	ug/L		104	80	117	pass

Table E-5. Data Quality Assessment
Evaluation of Matrix Spike (MS) Sample Results

B. GROUNDWATER SAMPLES

Sample ID	Anayte	Analyte Type	Field Sample Result (ug/L)		Spike Amount (ug/L)	Matrix Spike Result (ug/L)			Percent Recovery	Lower Limit	Upper Limit	QC Acceptance Criteria Evaluation
PS-1-050205	Arsenic	Dissolved	ND		40	40.8	ug/L		101	79	120	pass
PS-1-050205	Barium	Dissolved	65		2000	2160	ug/L		105	85	120	pass
PS-1-050205	Beryllium	Dissolved	ND		40	42.1	ug/L		105	76	126	pass
PS-1-050205	Cadmium	Dissolved	ND		40	38.9	ug/L		97	82	115	pass
PS-1-050205	Calcium	Dissolved	65000		50000	115000	ug/L		100	48	153	pass
PS-1-050205	Chromium	Dissolved	ND		200	202	ug/L		101	73	135	pass
PS-1-050205	Cobalt	Dissolved	ND		500	506	ug/L		99	82	119	pass
PS-1-050205	Copper	Dissolved	ND		250	257	ug/L		102	82	129	pass
PS-1-050205	Iron	Dissolved	150		1000	1170	ug/L		102	52	155	pass
PS-1-050205	Lead	Dissolved	ND		500	506	ug/L		101	89	121	pass
PS-1-050205	Magnesium	Dissolved	12000		50000	63700	ug/L		104	62	146	pass
PS-1-050205	Manganese	Dissolved	360		500	844	ug/L		98	79	121	pass
PS-1-050205	Mercury	Dissolved	ND		5	5.16	ug/L		103	85	114	pass
PS-1-050205	Nickel	Dissolved	ND		500	504	ug/L		101	84	120	pass
PS-1-050205	Potassium	Dissolved	8600		50000	61600	ug/L		106	76	132	pass
PS-1-050205	Selenium	Dissolved	ND		2000	2090	ug/L		104	71	140	pass
PS-1-050205	Silver	Dissolved	ND		50	54.9	ug/L		110	75	141	pass
PS-1-050205	Sodium	Dissolved	330000		50000	376000	ug/L	NC MSB		70	203	NA
PS-1-050205	Thallium	Dissolved	ND		40	40.2	ug/L		101	77	124	pass
PS-1-050205	Vanadium	Dissolved	ND		500	504	ug/L		100	85	120	pass
PS-1-050205	Zinc	Dissolved	ND		500	493	ug/L		97	60	137	pass
PS-1-050205	Aluminum	Total	100000		2000	152000	ug/L			83	119	NA
PS-1-050205	Antimony	Total	ND	R	40	9.18	ug/L		22	89	109	**fail**
PS-1-050205	Arsenic	Total	28	J	40	60.1	ug/L		80	87	109	**fail**
PS-1-050205	Barium	Total	1400	J	2000	3290	ug/L		96	85	120	pass
PS-1-050205	Beryllium	Total	4.4		40	33.7	ug/L		73	86	115	**fail**
PS-1-050205	Cadmium	Total	1.6		40	39.8	ug/L		96	89	110	pass
PS-1-050205	Calcium	Total	100000		50000	148000	ug/L		88	48	153	pass
PS-1-050205	Chromium	Total	160		200	366	ug/L		101	73	135	pass
PS-1-050205	Cobalt	Total	50		500	516	ug/L		93	82	119	pass
PS-1-050205	Copper	Total	98		250	339	ug/L		97	82	129	pass
PS-1-050205	Iron	Total	170000		1000	177000	ug/L	NC MSB		52	155	NA
PS-1-050205	Lead	Total	110		500	568	ug/L		92	89	121	pass
PS-1-050205	Magnesium	Total	33000		50000	84400	ug/L		102	62	146	pass
PS-1-050205	Manganese	Total	5800		500	6100	ug/L	NC MSB		79	121	NA
PS-1-050205	Mercury	Total	ND		5	5.14	ug/L		100	85	114	pass
PS-1-050205	Nickel	Total	70		500	541	ug/L		94	84	120	pass
PS-1-050205	Potassium	Total	19000		50000	69800	ug/L		101	76	132	pass
PS-1-050205	Selenium	Total	ND		2000	1890	ug/L		94	71	140	pass
PS-1-050205	Silver	Total	ND		50	52.3	ug/L		103	75	141	pass
PS-1-050205	Sodium	Total	300000		50000	342000	ug/L	NC MSB		70	203	NA
PS-1-050205	Thallium	Total	1.2		40	37	ug/L		90	84	120	pass
PS-1-050205	Vanadium	Total	220		500	743	ug/L		105	85	120	pass
PS-1-050205	Zinc	Total	420		500	868	ug/L		89	60	137	pass
KP-PS-18-091905	Aluminum	Dissolved	160		2000	2320	ug/L		108	83	119	pass
KP-PS-18-091905	Aluminum	Total	32000		2000	55100	ug/L	NC MSB		83	119	NA
KP-PS-18-091905	Antimony	Dissolved	ND		40	40.7	ug/L		101	80	117	pass
KP-PS-18-091905	Antimony	Total	ND	UJ	40	21.5	ug/L	N	52	89	109	**fail**
KP-PS-18-091905	Arsenic	Dissolved	ND		40	40.5	ug/L		100	79	120	pass
KP-PS-18-091905	Arsenic	Total	11		40	47.8	ug/L		92	87	109	pass
KP-PS-18-091905	Barium	Dissolved	170		2000	2230	ug/L		103	85	120	pass
KP-PS-18-091905	Barium	Total	670		2000	2660	ug/L		99	85	120	pass

Table E-5. Data Quality Assessment
Evaluation of Matrix Spike (MS) Sample Results

B. GROUNDWATER SAMPLES

Sample ID	Anayte	Analyte Type	Field Sample Result (ug/L)		Spike Amount (ug/L)	Matrix Spike Result (ug/L)			Percent Recovery	Lower Limit	Upper Limit	QC Acceptance Criteria Evaluation
KP-PS-18-091905	Beryllium	Dissolved	ND		40	43.2	ug/L		108	76	126	pass
KP-PS-18-091905	Beryllium	Total	2.4		40	35.6	ug/L	N	83	86	115	fail
KP-PS-18-091905	Cadmium	Dissolved	2.3		40	41	ug/L		97	82	115	pass
KP-PS-18-091905	Cadmium	Total	14		40	52.5	ug/L		95	89	110	pass
KP-PS-18-091905	Calcium	Dissolved	110000		50000	161000	ug/L		95	48	153	pass
KP-PS-18-091905	Calcium	Total	110000		50000	158000	ug/L		97	48	153	pass
KP-PS-18-091905	Chromium	Dissolved	ND		200	194	ug/L		96	73	135	pass
KP-PS-18-091905	Chromium	Total	60		200	259	ug/L		99	73	135	pass
KP-PS-18-091905	Cobalt	Dissolved	ND		500	494	ug/L		97	82	119	pass
KP-PS-18-091905	Cobalt	Total	27		500	511	ug/L		97	82	119	pass
KP-PS-18-091905	Copper	Dissolved	ND		250	268	ug/L		104	82	129	pass
KP-PS-18-091905	Copper	Total	69		250	328	ug/L		104	82	129	pass
KP-PS-18-091905	Iron	Dissolved	240		1000	1240	ug/L		101	52	155	pass
KP-PS-18-091905	Iron	Total	49000		1000	54700	ug/L	NC MSB		52	155	NA
KP-PS-18-091905	Lead	Dissolved	ND		500	497	ug/L		99	89	121	pass
KP-PS-18-091905	Lead	Total	54		500	533	ug/L		96	89	121	pass
KP-PS-18-091905	Magnesium	Dissolved	25000		50000	73300	ug/L		97	62	146	pass
KP-PS-18-091905	Magnesium	Total	29000		50000	78700	ug/L		99	62	146	pass
KP-PS-18-091905	Manganese	Dissolved	2900		500	3320	ug/L	NC MSB		79	121	NA
KP-PS-18-091905	Manganese	Total	6800		500	7290	ug/L	NC MSB		79	121	NA
KP-PS-18-091905	Mercury	Dissolved	ND		5	5.09	ug/L		102	85	114	pass
KP-PS-18-091905	Mercury	Total	ND		5	4.48	ug/L		88	85	114	pass
KP-PS-18-091905	Nickel	Dissolved	ND		500	492	ug/L		97	84	120	pass
KP-PS-18-091905	Nickel	Total	47		500	521	ug/L		95	84	120	pass
KP-PS-18-091905	Potassium	Dissolved	29000		50000	80400	ug/L		104	76	132	pass
KP-PS-18-091905	Potassium	Total	34000		50000	87800	ug/L		107	76	132	pass
KP-PS-18-091905	Selenium	Dissolved	ND		2000	2110	ug/L		105	71	140	pass
KP-PS-18-091905	Selenium	Total	ND		2000	2030	ug/L		101	71	140	pass
KP-PS-18-091905	Silver	Dissolved	ND		50	53.8	ug/L		106	75	141	pass
KP-PS-18-091905	Silver	Total	ND		50	51.8	ug/L		104	75	141	pass
KP-PS-18-091905	Sodium	Dissolved	180000		50000	234000	ug/L		100	70	203	pass
KP-PS-18-091905	Sodium	Total	170000		50000	222000	ug/L		100	70	203	pass
KP-PS-18-091905	Thallium	Dissolved	ND		40	42.5	ug/L		106	77	124	pass
KP-PS-18-091905	Thallium	Total	ND		40	41.1	ug/L		101	84	120	pass
KP-PS-18-091905	Vanadium	Dissolved	ND		500	495	ug/L		99	85	120	pass
KP-PS-18-091905	Vanadium	Total	79		500	582	ug/L		101	85	120	pass
KP-PS-18-091905	Zinc	Dissolved	36		500	486	ug/L		90	60	137	pass
KP-PS-18-091905	Zinc	Total	470		500	931	ug/L		93	60	137	pass

Fail = Percent recovery does not meet QC acceptance criteria (recoveries are outside of documented historical lab acceptance limits for a chemical).

N = Percent recoveries outside QC control limits.

NC MSB = Not calculated. Parent sample concentrations greater than four times the spiked amounts

NA = QC acceptance criteria not evaluated Percent recovery not available for analyte.

Pass = Percent recovery within QC acceptance criteria (recoveries are within documented historical lab acceptance limits for a chemical).

QC = Quality Control

Table E-6. Data Quality Assessment
Evaluation of Laboratory Control Sample (LCS) Results

A. SOIL

Lab Sample ID	Sample Analysis Lot	Analysis Date/Time	Anayte	Analyte Type	Result (mg/kg)	Spike Amount	Percent Recovery (%)	Lower Limit (%)	Upper Limit (%)	QC Acceptance Criteria Evaluation
D3L230000649C	D3L190461	1/5/2004 6:26	Aluminum	Total	201	200	100	80	110	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Antimony	Total	48.4	50	97	80	105	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Arsenic	Total	191	200	95	80	111	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Barium	Total	203	200	102	80	117	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Beryllium	Total	4.74	5	95	80	114	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Cadmium	Total	4.9	5	98	80	119	pass
D3L230000649C	D3L190461	1/5/2004 6:26	Calcium	Total	5060	5000	101	80	116	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Chromium	Total	19.6	20	98	80	120	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Cobalt	Total	48.3	50	97	80	112	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Copper	Total	23.7	25	95	80	117	pass
D3L230000649C	D3L190461	1/5/2004 6:26	Iron	Total	99.7	100	100	80	120	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Lead	Total	50.4	50	101	80	116	pass
D3L230000649C	D3L190461	1/5/2004 6:26	Magnesium	Total	5030	5000	101	80	115	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Manganese	Total	49	50	98	80	113	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Nickel	Total	48.5	50	97	80	115	pass
D3L230000649C	D3L190461	1/5/2004 6:26	Potassium	Total	4390	5000	88	80	111	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Selenium	Total	198	200	99	80	112	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Silver	Total	4.8	5	96	80	109	pass
D3L230000649C	D3L190461	1/5/2004 6:26	Sodium	Total	4760	5000	95	80	117	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Thallium	Total	194	200	97	80	109	pass
D3L230000649C	D3L190461	12/31/2003 21:20	Vanadium	Total	48.8	50	98	80	113	pass
D3L230000649C	D3L190461	1/5/2004 6:26	Zinc	Total	49.8	50	100	80	115	pass
D3L230000648C	D3L190419	1/5/2004 1:03	Aluminum	Total	208	200	104	80	110	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Antimony	Total	47	50	94	80	105	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Arsenic	Total	188	200	94	80	111	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Barium	Total	197	200	98	80	117	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Beryllium	Total	4.64	5	93	80	114	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Cadmium	Total	4.82	5	96	80	119	pass
D3L230000648C	D3L190419	1/5/2004 1:03	Calcium	Total	5160	5000	103	80	116	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Chromium	Total	19.4	20	97	80	120	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Cobalt	Total	47.5	50	95	80	112	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Copper	Total	23	25	92	80	117	pass
D3L230000648C	D3L190419	1/5/2004 1:03	Iron	Total	103	100	103	80	120	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Lead	Total	48.4	50	97	80	116	pass
D3L230000648C	D3L190419	1/5/2004 1:03	Magnesium	Total	5110	5000	102	80	115	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Manganese	Total	48.3	50	97	80	113	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Nickel	Total	47.8	50	96	80	115	pass
D3L230000648C	D3L190419	1/5/2004 1:03	Potassium	Total	4440	5000	89	80	111	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Selenium	Total	188	200	94	80	112	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Silver	Total	4.68	5	94	80	109	pass
D3L230000648C	D3L190419	1/5/2004 1:03	Sodium	Total	4890	5000	98	80	117	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Thallium	Total	185	200	93	80	109	pass
D3L230000648C	D3L190419	12/30/2003 18:10	Vanadium	Total	48.2	50	96	80	113	pass
D3L230000648C	D3L190419	1/5/2004 1:03	Zinc	Total	50.2	50	100	80	115	pass
D3L230000647C	D3L190464	1/5/2004 4:09	Aluminum	Total	194	200	97	80	110	pass
D3L230000647C	D3L190464	1/4/2004 2:13	Antimony	Total	49.4	50	99	80	105	pass

Table E-6. Data Quality Assessment
Evaluation of Laboratory Control Sample (LCS) Results

A. SOIL

Lab Sample ID	Sample Analysis Lot	Analysis Date/Time	Anayte	Analyte Type	Result (mg/kg)	Spike Amount	Percent Recovery (%)	Lower Limit (%)	Upper Limit (%)	QC Acceptance Criteria Evaluation
D3L230000647C	D3L190464	1/4/2004 2:13	Arsenic	Total	196	200	98	80	111	pass
D3L230000647C	D3L190464	1/4/2004 2:13	Barium	Total	206	200	103	80	117	pass
D3L230000647C	D3L190464	1/4/2004 2:13	Beryllium	Total	4.72	5	94	80	114	pass
D3L230000647C	D3L190464	1/4/2004 2:13	Cadmium	Total	4.95	5	99	80	119	pass
D3L230000647C	D3L190464	1/5/2004 4:09	Calcium	Total	4960	5000	99	80	116	pass
D3L230000647C	D3L190464	1/4/2004 2:13	Chromium	Total	19.7	20	98	80	120	pass
D3L230000647C	D3L190464	1/4/2004 2:13	Cobalt	Total	49.2	50	98	80	112	pass
D3L230000647C	D3L190464	1/4/2004 2:13	Copper	Total	23.6	25	94	80	117	pass
D3L230000647C	D3L190464	1/5/2004 4:09	Iron	Total	97.4	100	97	80	120	pass
D3L230000647C	D3L190464	1/4/2004 2:13	Lead	Total	50.3	50	101	80	116	pass
D3L230000647C	D3L190464	1/5/2004 4:09	Magnesium	Total	4900	5000	98	80	115	pass
D3L230000647C	D3L190464	1/5/2004 4:09	Manganese	Total	48.7	50	97	80	113	pass
D3L230000647C	D3L190464	1/4/2004 2:13	Nickel	Total	50.2	50	100	80	115	pass
D3L230000647C	D3L190464	1/5/2004 4:09	Potassium	Total	4250	5000	85	80	111	pass
D3L230000647C	D3L190464	1/4/2004 2:13	Selenium	Total	200	200	100	80	112	pass
D3L230000647C	D3L190464	1/4/2004 2:13	Silver	Total	4.9	5	98	80	109	pass
D3L230000647C	D3L190464	1/5/2004 4:09	Sodium	Total	4570	5000	91	80	117	pass
D3L230000647C	D3L190464	1/4/2004 2:13	Thallium	Total	197	200	99	80	109	pass
D3L230000647C	D3L190464	1/4/2004 2:13	Vanadium	Total	48.7	50	97	80	113	pass
D3L230000647C	D3L190464	1/5/2004 4:09	Zinc	Total	49.4	50	99	80	115	pass
D3L220000303C	D3L190464	12/31/2003 14:22	Mercury	Total	0.76	0.833	91	82	113	pass
D3L220000302C	D3L190461	12/31/2003 13:42	Mercury	Total	0.84	0.833	101	82	113	pass
D3L220000301C	D3L190419	12/31/2003 12:15	Mercury	Total	0.83	0.833	100	82	113	pass
D3L220000300C	D3L190405	12/23/2003 16:20	Mercury	Total	0.823	0.833	99	82	113	pass
D3L220000299C	D3L190390	12/27/2003 21:21	Mercury	Total	0.848	0.833	102	82	113	pass
D3L220000299C	D3L190405	12/27/2003 21:21	Mercury	Total	0.848	0.833	102	82	113	pass
D3L220000296C	D3L190390	12/23/2003 14:40	Mercury	Total	0.828	0.833	99	82	113	pass
D3L190000678C	D3L190405	12/30/2003 3:07	Aluminum	Total	185	200	93	80	110	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Antimony	Total	47.3	50	95	80	105	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Arsenic	Total	191	200	95	80	111	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Barium	Total	196	200	98	80	117	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Beryllium	Total	4.64	5	93	80	114	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Cadmium	Total	4.78	5	96	80	119	pass
D3L190000678C	D3L190405	12/30/2003 3:07	Calcium	Total	4690	5000	94	80	116	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Chromium	Total	19.3	20	96	80	120	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Cobalt	Total	47.4	50	95	80	112	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Copper	Total	23.3	25	93	80	117	pass
D3L190000678C	D3L190405	12/30/2003 3:07	Iron	Total	93.6	100	94	80	120	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Lead	Total	49.5	50	99	80	116	pass
D3L190000678C	D3L190405	12/30/2003 3:07	Magnesium	Total	4790	5000	96	80	115	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Manganese	Total	47.7	50	95	80	113	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Nickel	Total	47.9	50	96	80	115	pass
D3L190000678C	D3L190405	12/30/2003 3:07	Potassium	Total	4840	5000	97	80	111	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Selenium	Total	201	200	101	80	112	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Silver	Total	4.68	5	94	80	109	pass
D3L190000678C	D3L190405	12/30/2003 3:07	Sodium	Total	4830	5000	97	80	117	pass

Table E-6. Data Quality Assessment
Evaluation of Laboratory Control Sample (LCS) Results

A. SOIL

Lab Sample ID	Sample Analysis Lot	Analysis Date/Time	Anayte	Analyte Type	Result (mg/kg)	Spike Amount	Percent Recovery (%)	Lower Limit (%)	Upper Limit (%)	QC Acceptance Criteria Evaluation
D3L190000678C	D3L190405	12/23/2003 19:13	Thallium	Total	191	200	96	80	109	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Vanadium	Total	47.9	50	96	80	113	pass
D3L190000678C	D3L190405	12/23/2003 19:13	Zinc	Total	46.3	50	93	80	115	pass
D3L190000594C	D3L190390	12/30/2003 0:05	Aluminum	Total	197	200	98	80	110	pass
D3L190000594C	D3L190390	12/23/2003 14:34	Antimony	Total	51	50	102	80	105	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Arsenic	Total	216	200	108	80	111	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Barium	Total	226	200	113	80	117	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Beryllium	Total	5.12	5	102	80	114	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Cadmium	Total	5.48	5	110	80	119	pass
D3L190000594C	D3L190390	12/30/2003 0:05	Calcium	Total	4980	5000	100	80	116	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Chromium	Total	21.7	20	109	80	120	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Cobalt	Total	53.9	50	108	80	112	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Copper	Total	26.8	25	107	80	117	pass
D3L190000594C	D3L190390	12/30/2003 0:05	Iron	Total	99.9	100	100	80	120	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Lead	Total	56.2	50	112	80	116	pass
D3L190000594C	D3L190390	12/30/2003 0:05	Magnesium	Total	5120	5000	102	80	115	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Manganese	Total	54.7	50	109	80	113	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Nickel	Total	55.2	50	110	80	115	pass
D3L190000594C	D3L190390	12/30/2003 0:05	Potassium	Total	5130	5000	103	80	111	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Selenium	Total	221	200	111	80	112	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Silver	Total	5.25	5	105	80	109	pass
D3L190000594C	D3L190390	12/30/2003 0:05	Sodium	Total	4980	5000	100	80	117	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Thallium	Total	215	200	108	80	109	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Vanadium	Total	54.3	50	109	80	113	pass
D3L190000594C	D3L190390	12/22/2003 23:43	Zinc	Total	52.2	50	104	80	115	pass
D3L130000135C	D3L110408	12/28/2003 19:24	Aluminum	Total	194	200	97	80	110	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Antimony	Total	49.5	50	99	80	105	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Arsenic	Total	201	200	100	80	111	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Barium	Total	207	200	103	80	117	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Beryllium	Total	4.87	5	97	80	114	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Cadmium	Total	4.91	5	98	80	119	pass
D3L130000135C	D3L110408	12/28/2003 19:24	Calcium	Total	5060	5000	101	80	116	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Chromium	Total	19.4	20	97	80	120	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Cobalt	Total	48.3	50	97	80	112	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Copper	Total	25.2	25	101	80	117	pass
D3L130000135C	D3L110408	12/28/2003 19:24	Iron	Total	101	100	101	80	120	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Lead	Total	51	50	102	80	116	pass
D3L130000135C	D3L110408	12/28/2003 19:24	Magnesium	Total	5070	5000	101	80	115	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Manganese	Total	49.3	50	99	80	113	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Nickel	Total	47.8	50	96	80	115	pass
D3L130000135C	D3L110408	12/28/2003 19:24	Potassium	Total	5000	5000	100	80	111	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Selenium	Total	210	200	105	80	112	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Silver	Total	4.61	5	92	80	109	pass
D3L130000135C	D3L110408	12/28/2003 19:24	Sodium	Total	4980	5000	100	80	117	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Thallium	Total	201	200	101	80	109	pass
D3L130000135C	D3L110408	12/19/2003 17:24	Vanadium	Total	48.6	50	97	80	113	pass

Table E-6. Data Quality Assessment
Evaluation of Laboratory Control Sample (LCS) Results

A. SOIL

Lab Sample ID	Sample Analysis Lot	Analysis Date/Time	Anayte	Analyte Type	Result (mg/kg)	Spike Amount	Percent Recovery (%)	Lower Limit (%)	Upper Limit (%)	QC Acceptance Criteria Evaluation
D3L130000135C	D3L110408	12/19/2003 17:24	Zinc	Total	45.2	50	90	80	115	pass
D3L120000435C	D3L110408	12/18/2003 16:40	Mercury	Total	0.807	0.833	97	82	113	pass
D3L120000434C	D3L110408	12/17/2003 17:36	Mercury	Total	0.808	0.833	97	82	113	pass
D3L110000608C	D3L100414	12/29/2003 19:05	Aluminum	Total	189	200	94	80	110	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Antimony	Total	45.8	50	92	80	105	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Arsenic	Total	185	200	93	80	111	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Barium	Total	196	200	98	80	117	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Beryllium	Total	4.26	5	85	80	114	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Cadmium	Total	4.57	5	91	80	119	pass
D3L110000608C	D3L100414	12/29/2003 19:05	Calcium	Total	4820	5000	96	80	116	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Chromium	Total	18.1	20	90	80	120	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Cobalt	Total	45.5	50	91	80	112	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Copper	Total	23.6	25	94	80	117	pass
D3L110000608C	D3L100414	12/29/2003 19:05	Iron	Total	97.1	100	97	80	120	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Lead	Total	47.8	50	96	80	116	pass
D3L110000608C	D3L100414	12/29/2003 19:05	Magnesium	Total	4850	5000	97	80	115	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Manganese	Total	45.4	50	91	80	113	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Nickel	Total	45.9	50	92	80	115	pass
D3L110000608C	D3L100414	12/29/2003 19:05	Potassium	Total	4730	5000	95	80	111	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Selenium	Total	193	200	96	80	112	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Silver	Total	4.5	5	90	80	109	pass
D3L110000608C	D3L100414	12/29/2003 19:05	Sodium	Total	4810	5000	96	80	117	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Thallium	Total	189	200	94	80	109	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Vanadium	Total	45.9	50	92	80	113	pass
D3L110000608C	D3L100414	12/19/2003 11:18	Zinc	Total	43	50	86	80	115	pass
D3L110000321C	D3L100414	12/18/2003 16:15	Mercury	Total	0.815	0.833	98	82	113	pass
D3L110000319C	D3L100414	12/18/2003 15:24	Mercury	Total	0.83	0.833	100	82	113	pass

Fail = Percent recovery does not meet QC acceptance criteria (recoveries are outside of documented historical lab acceptance limits for a chemical).
Pass = Percent recovery within QC acceptance criteria (recoveries are within documented historical lab acceptance limits for a chemical).
QC = Quality Control

Table E-6. Data Quality Assessment
Evaluation of Laboratory Control Sample (LCS) Results

B. GROUNDWATER

Lab Sample ID	Sample Analysis Lot	Analysis Date/Time	Anayte	Analyte Type	Result (ug/L)	Spike Amount	Percent Recovery (%)	Lower Limit (%)	Upper Limit (%)	QC Acceptance Criteria Evaluation
D3L110000334C	D3L100414	12/15/2003 18:44	Mercury	Total	5.15	5	103	84	114	pass
D3L120000442C	D3L110408	12/15/2003 17:20	Mercury	Total	4.91	5	98	84	114	pass
D3L130000128C	D3L110408	12/19/2003 2:56	Antimony	Total	39.8	40	100	89	109	pass
D3L130000128C	D3L110408	12/19/2003 2:56	Arsenic	Total	38.6	40	96	87	109	pass
D3L130000128C	D3L110408	12/19/2003 2:56	Beryllium	Total	35.5	40	89	86	115	pass
D3L130000128C	D3L110408	12/19/2003 2:56	Cadmium	Total	39.1	40	98	89	110	pass
D3L130000128C	D3L110408	12/19/2003 2:56	Thallium	Total	42.4	40	106	84	120	pass
D3L130000167C	D3L110408	12/22/2003 14:40	Aluminum	Total	1940	2000	97	86	108	pass
D3L130000167C	D3L110408	12/16/2003 11:11	Barium	Total	2160	2000	108	93	113	pass
D3L130000167C	D3L110408	12/22/2003 14:40	Calcium	Total	50100	50000	100	89	110	pass
D3L130000167C	D3L110408	12/16/2003 11:11	Chromium	Total	218	200	109	89	112	pass
D3L130000167C	D3L110408	12/16/2003 11:11	Cobalt	Total	527	500	105	86	107	pass
D3L130000167C	D3L110408	12/16/2003 11:11	Copper	Total	258	250	103	86	110	pass
D3L130000167C	D3L110408	12/22/2003 14:40	Iron	Total	1010	1000	101	88	110	pass
D3L130000167C	D3L110408	12/16/2003 11:11	Lead	Total	526	500	105	91	111	pass
D3L130000167C	D3L110408	12/22/2003 14:40	Magnesium	Total	49900	50000	100	91	111	pass
D3L130000167C	D3L110408	12/16/2003 11:11	Manganese	Total	543	500	109	90	110	pass
D3L130000167C	D3L110408	12/16/2003 11:11	Nickel	Total	528	500	106	90	110	pass
D3L130000167C	D3L110408	12/22/2003 14:40	Potassium	Total	47400	50000	95	86	111	pass
D3L130000167C	D3L110408	12/16/2003 11:11	Selenium	Total	2050	2000	103	88	110	pass
D3L130000167C	D3L110408	12/16/2003 11:11	Silver	Total	49.8	50	100	85	114	pass
D3L130000167C	D3L110408	12/22/2003 14:40	Sodium	Total	47600	50000	95	91	112	pass
D3L130000167C	D3L110408	12/16/2003 11:11	Vanadium	Total	546	500	109	88	112	pass
D3L130000167C	D3L110408	12/16/2003 11:11	Zinc	Total	498	500	100	85	110	pass
D3L160000478C	D3L100414	12/29/2003 5:22	Aluminum	Total	1990	2000	100	86	108	pass
D3L160000478C	D3L100414	12/19/2003 13:40	Barium	Total	2000	2000	100	93	113	pass
D3L160000478C	D3L100414	12/29/2003 5:22	Calcium.	Total	50900	50000	102	89	110	pass
D3L160000478C	D3L100414	12/19/2003 13:40	Chromium	Total	193	200	97	89	112	pass
D3L160000478C	D3L100414	12/19/2003 13:40	Cobalt	Total	476	500	95	86	107	pass
D3L160000478C	D3L100414	12/19/2003 13:40	Copper	Total	236	250	94	86	110	pass
D3L160000478C	D3L100414	12/29/2003 5:22	Iron	Total	1010	1000	101	88	110	pass
D3L160000478C	D3L100414	12/19/2003 13:40	Lead	Total	492	500	98	91	111	pass
D3L160000478C	D3L100414	12/29/2003 5:22	Magnesium	Total	51900	50000	104	91	111	pass
D3L160000478C	D3L100414	12/19/2003 13:40	Manganese	Total	478	500	96	90	110	pass
D3L160000478C	D3L100414	12/19/2003 13:40	Nickel	Total	482	500	96	90	110	pass
D3L160000478C	D3L100414	12/29/2003 5:22	Potassium	Total	51200	50000	102	86	111	pass
D3L160000478C	D3L100414	12/19/2003 13:40	Selenium	Total	1950	2000	97	88	110	pass
D3L160000478C	D3L100414	12/19/2003 13:40	Silver	Total	47.1	50	94	85	114	pass
D3L160000478C	D3L100414	12/29/2003 5:22	Sodium	Total	50800	50000	102	91	112	pass
D3L160000478C	D3L100414	12/19/2003 13:40	Vanadium	Total	494	500	99	88	112	pass
D3L160000478C	D3L100414	12/19/2003 13:40	Zinc	Total	459	500	92	85	110	pass
D3L170000625C	D3L100414	12/24/2003 7:20	Antimony	Total	41	40	102	89	109	pass
D3L170000625C	D3L100414	12/24/2003 7:20	Arsenic	Total	40.1	40	100	87	109	pass
D3L170000625C	D3L100414	12/24/2003 7:20	Beryllium	Total	42.8	40	107	86	115	pass
D3L170000625C	D3L100414	12/24/2003 7:20	Cadmium	Total	40.8	40	102	89	110	pass
D3L170000625C	D3L100414	12/24/2003 7:20	Thallium	Total	42.4	40	106	84	120	pass

Table E-6. Data Quality Assessment
Evaluation of Laboratory Control Sample (LCS) Results

B. GROUNDWATER

Lab Sample ID	Sample Analysis Lot	Analysis Date/Time	Anayte	Analyte Type	Result (ug/L)	Spike Amount	Percent Recovery (%)	Lower Limit (%)	Upper Limit (%)	QC Acceptance Criteria Evaluation
D3L210000117C	D3L190390	12/24/2003 6:19	Antimony	Total	40.4	40	101	89	109	pass
D3L210000117C	D3L190390	12/24/2003 6:19	Arsenic	Total	39.5	40	99	87	109	pass
D3L210000117C	D3L190390	12/24/2003 6:19	Beryllium	Total	41.9	40	105	86	115	pass
D3L210000117C	D3L190390	12/24/2003 6:19	Cadmium	Total	40.5	40	101	89	110	pass
D3L210000117C	D3L190390	12/24/2003 6:19	Thallium	Total	41.7	40	104	84	120	pass
D3L210000118C	D3L190390	12/29/2003 7:31	Aluminum	Total	2010	2000	101	86	108	pass
D3L210000118C	D3L190390	12/23/2003 17:15	Barium	Total	2130	2000	107	93	113	pass
D3L210000118C	D3L190390	12/29/2003 7:31	Calcium	Total	51700	50000	103	89	110	pass
D3L210000118C	D3L190390	12/23/2003 17:15	Chromium	Total	212	200	106	89	112	pass
D3L210000118C	D3L190390	12/23/2003 17:15	Cobalt	Total	515	500	103	86	107	pass
D3L210000118C	D3L190390	12/23/2003 17:15	Copper	Total	252	250	101	86	110	pass
D3L210000118C	D3L190390	12/29/2003 7:31	Iron	Total	1030	1000	103	88	110	pass
D3L210000118C	D3L190390	12/23/2003 17:15	Lead	Total	528	500	106	91	111	pass
D3L210000118C	D3L190390	12/29/2003 7:31	Magnesium	Total	52400	50000	105	91	111	pass
D3L210000118C	D3L190390	12/23/2003 17:15	Manganese	Total	518	500	104	90	110	pass
D3L210000118C	D3L190390	12/23/2003 17:15	Nickel	Total	519	500	104	90	110	pass
D3L210000118C	D3L190390	12/29/2003 7:31	Potassium	Total	52400	50000	105	86	111	pass
D3L210000118C	D3L190390	12/23/2003 17:15	Selenium	Total	2110	2000	106	88	110	pass
D3L210000118C	D3L190390	12/23/2003 17:15	Silver	Total	49.4	50	99	85	114	pass
D3L210000118C	D3L190390	12/29/2003 7:31	Sodium	Total	50500	50000	101	91	112	pass
D3L210000118C	D3L190390	12/23/2003 17:15	Vanadium	Total	532	500	106	88	112	pass
D3L210000118C	D3L190390	12/23/2003 17:15	Zinc	Total	497	500	99	85	110	pass
D3L220000305C	D3L190390	12/22/2003 18:57	Mercury	Total	4.82	5	96	84	114	pass
D3L220000306C	D3L190419	12/30/2003 17:33	Mercury	Total	4.8	5	96	84	114	pass
D3L220000307C	D3L190461	12/30/2003 18:48	Mercury	Total	4.82	5	96	84	114	pass
D3L300000671C	D3L190419	1/7/2004 18:16	Aluminum	Total	1970	2000	99	86	108	pass
D3L300000671C	D3L190461	1/7/2004 18:16	Aluminum	Total	1970	2000	99	86	108	pass
D3L300000671C	D3L190419	1/7/2004 14:53	Barium	Total	2150	2000	107	93	113	pass
D3L300000671C	D3L190461	1/7/2004 14:53	Barium	Total	2150	2000	107	93	113	pass
D3L300000671C	D3L190419	1/7/2004 18:16	Calcium	Total	49100	50000	98	89	110	pass
D3L300000671C	D3L190461	1/7/2004 18:16	Calcium	Total	49100	50000	98	89	110	pass
D3L300000671C	D3L190461	1/7/2004 14:53	Chromium	Total	211	200	105	89	112	pass
D3L300000671C	D3L190419	1/7/2004 14:53	Chromium	Total	211	200	105	89	112	pass
D3L300000671C	D3L190419	1/7/2004 14:53	Cobalt	Total	510	500	102	86	107	pass
D3L300000671C	D3L190461	1/7/2004 14:53	Cobalt	Total	510	500	102	86	107	pass
D3L300000671C	D3L190419	1/7/2004 14:53	Copper	Total	256	250	102	86	110	pass
D3L300000671C	D3L190419	1/7/2004 18:16	Iron	Total	989	1000	99	88	110	pass
D3L300000671C	D3L190419	1/7/2004 14:53	Lead	Total	515	500	103	91	111	pass
D3L300000671C	D3L190419	1/7/2004 18:16	Magnesium	Total	51100	50000	102	91	111	pass
D3L300000671C	D3L190419	1/7/2004 14:53	Manganese	Total	526	500	105	90	110	pass
D3L300000671C	D3L190419	1/7/2004 14:53	Nickel	Total	503	500	101	90	110	pass
D3L300000671C	D3L190419	1/7/2004 18:16	Potassium	Total	53700	50000	107	86	111	pass
D3L300000671C	D3L190419	1/7/2004 14:53	Selenium	Total	1960	2000	98	88	110	pass
D3L300000671C	D3L190419	1/7/2004 14:53	Silver	Total	49.6	50	99	85	114	pass
D3L300000671C	D3L190419	1/7/2004 18:16	Sodium	Total	50000	50000	100	91	112	pass
D3L300000671C	D3L190419	1/7/2004 14:53	Vanadium	Total	526	500	105	88	112	pass

Table E-6. Data Quality Assessment
Evaluation of Laboratory Control Sample (LCS) Results

B. GROUNDWATER

Lab Sample ID	Sample Analysis Lot	Analysis Date/Time	Anayte	Analyte Type	Result (ug/L)	Spike Amount	Percent Recovery (%)	Lower Limit (%)	Upper Limit (%)	QC Acceptance Criteria Evaluation
D3L300000671C	D3L190419	1/7/2004 14:53	Zinc	Total	490	500	98	85	110	pass
D3L300000672C	D3L190419	1/7/2004 17:57	Antimony	Total	42.3	40	106	89	109	pass
D3L300000672C	D3L190419	1/7/2004 17:57	Arsenic	Total	39.9	40	100	87	109	pass
D3L300000672C	D3L190419	1/7/2004 17:57	Beryllium	Total	37.9	40	95	86	115	pass
D3L300000672C	D3L190419	1/7/2004 17:57	Cadmium	Total	39.8	40	100	89	110	pass
D3L300000672C	D3L190419	1/7/2004 17:57	Thallium	Total	42.2	40	105	84	120	pass
	D4E040112	5/17/2004 12:18:00 AM	Aluminum	Dissolved	2010	2000	100	86	108	pass
	D4E040112	5/17/2004 8:26:00 PM	Antimony	Dissolved	39.9	40	100	89	109	pass
	D4E040112	5/17/2004 8:26:00 PM	Arsenic	Dissolved	39.8	40	100	87	109	pass
	D4E040112	5/15/2004 2:50:00 AM	Barium	Dissolved	2120	2000	106	93	113	pass
	D4E040112	5/17/2004 8:26:00 PM	Beryllium	Dissolved	43.8	40	110	86	115	pass
	D4E040112	5/17/2004 8:26:00 PM	Cadmium	Dissolved	39.7	40	99	89	110	pass
	D4E040112	5/17/2004 12:18:00 AM	Calcium	Dissolved	48600	50000	97	89	110	pass
	D4E040112	5/15/2004 2:50:00 AM	Chromium	Dissolved	184	200	92	89	112	pass
	D4E040112	5/15/2004 2:50:00 AM	Cobalt	Dissolved	458	500	92	86	107	pass
	D4E040112	5/15/2004 2:50:00 AM	Copper	Dissolved	249	250	100	86	110	pass
	D4E040112	5/17/2004 12:18:00 AM	Iron	Dissolved	1030	1000	103	88	110	pass
	D4E040112	5/15/2004 2:50:00 AM	Lead	Dissolved	467	500	93	91	111	pass
	D4E040112	5/17/2004 12:18:00 AM	Magnesium	Dissolved	50500	50000	101	91	111	pass
	D4E040112	5/15/2004 2:50:00 AM	Manganese	Dissolved	473	500	95	90	110	pass
	D4E040112	5/13/2004 10:50:00 AM	Mercury	Dissolved	5.25	5	105	84	114	pass
	D4E040112	5/15/2004 2:50:00 AM	Nickel	Dissolved	465	500	93	90	110	pass
	D4E040112	5/17/2004 12:18:00 AM	Potassium	Dissolved	49300	50000	99	86	111	pass
	D4E040112	5/15/2004 2:50:00 AM	Selenium	Dissolved	1910	2000	95	88	110	pass
	D4E040112	5/15/2004 2:50:00 AM	Silver	Dissolved	49.8	50	100	85	114	pass
	D4E040112	5/17/2004 12:18:00 AM	Sodium	Dissolved	49400	50000	99	91	112	pass
	D4E040112	5/17/2004 8:26:00 PM	Thallium	Dissolved	41.4	40	103	84	120	pass
	D4E040112	5/15/2004 2:50:00 AM	Vanadium	Dissolved	471	500	94	88	112	pass
	D4E040112	5/15/2004 2:50:00 AM	Zinc	Dissolved	450	500	90	85	110	pass
	D4E040112	5/15/2004 8:31:00 AM	Aluminum	Total	2160	2000	108	86	108	pass
	D4E040112	5/18/2004 8:09:00 PM	Antimony	Total	39.9	40	100	89	109	pass
	D4E040112	5/18/2004 8:09:00 PM	Arsenic	Total	41.4	40	103	87	109	pass
	D4E040112	5/14/2004 10:11:00 PM	Barium	Total	2130	2000	107	93	113	pass
	D4E040112	5/18/2004 8:09:00 PM	Beryllium	Total	42	40	105	86	115	pass
	D4E040112	5/18/2004 8:09:00 PM	Cadmium	Total	40.8	40	102	89	110	pass
	D4E040112	5/15/2004 8:31:00 AM	Calcium	Total	52000	50000	104	89	110	pass
	D4E040112	5/14/2004 10:11:00 PM	Chromium	Total	191	200	95	89	112	pass
	D4E040112	5/14/2004 10:11:00 PM	Cobalt	Total	473	500	95	86	107	pass
	D4E040112	5/14/2004 10:11:00 PM	Copper	Total	248	250	99	86	110	pass
	D4E040112	5/15/2004 8:31:00 AM	Iron	Total	1070	1000	107	88	110	pass
	D4E040112	5/14/2004 10:11:00 PM	Lead	Total	479	500	96	91	111	pass
	D4E040112	5/15/2004 8:31:00 AM	Magnesium	Total	52700	50000	105	91	111	pass
	D4E040112	5/14/2004 10:11:00 PM	Manganese	Total	485	500	97	90	110	pass
	D4E040112	5/10/2004 3:19:00 PM	Mercury	Total	4.83	5	97	84	114	pass
	D4E040112	5/14/2004 10:11:00 PM	Nickel	Total	481	500	96	90	110	pass
	D4E040112	5/15/2004 8:31:00 AM	Potassium	Total	51000	50000	102	86	111	pass

Table E-6. Data Quality Assessment
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B. GROUNDWATER

Lab Sample ID	Sample Analysis Lot	Analysis Date/Time	Anayte	Analyte Type	Result (ug/L)	Spike Amount	Percent Recovery (%)	Lower Limit (%)	Upper Limit (%)	QC Acceptance Criteria Evaluation
	D4E040112	5/14/2004 10:11:00 PM	Selenium	Total	1920	2000	96	88	110	pass
	D4E040112	5/14/2004 10:11:00 PM	Silver	Total	50.4	50	101	85	114	pass
	D4E040112	5/15/2004 8:31:00 AM	Sodium	Total	51700	50000	103	91	112	pass
	D4E040112	5/18/2004 8:09:00 PM	Thallium	Total	42.5	40	106	84	120	pass
	D4E040112	5/14/2004 10:11:00 PM	Vanadium	Total	488	500	98	88	112	pass
	D4E040112	5/14/2004 10:11:00 PM	Zinc	Total	464	500	93	85	110	pass
	D4E260121	6/4/2004 2:17:00 AM	Aluminum	Dissolved	2100	2000	105	86	108	pass
	D4E260121	6/19/2004 8:08:00 PM	Antimony	Dissolved	38.7	40	97	89	109	pass
	D4E260121	6/19/2004 8:08:00 PM	Arsenic	Dissolved	40.3	40	101	87	109	pass
	D4E260121	6/1/2004 8:29:00 PM	Barium	Dissolved	2200	2000	110	93	113	pass
	D4E260121	6/19/2004 8:08:00 PM	Beryllium	Dissolved	45.7	40	114	86	115	pass
	D4E260121	6/19/2004 8:08:00 PM	Cadmium	Dissolved	40.5	40	101	89	110	pass
	D4E260121	6/4/2004 2:17:00 AM	Calcium	Dissolved	51400	50000	103	89	110	pass
	D4E260121	6/1/2004 8:29:00 PM	Chromium	Dissolved	201	200	100	89	112	pass
	D4E260121	6/1/2004 8:29:00 PM	Cobalt	Dissolved	490	500	98	86	107	pass
	D4E260121	6/1/2004 8:29:00 PM	Copper	Dissolved	271	250	108	86	110	pass
	D4E260121	6/4/2004 2:17:00 AM	Iron	Dissolved	1050	1000	105	88	110	pass
	D4E260121	6/1/2004 8:29:00 PM	Lead	Dissolved	499	500	100	91	111	pass
	D4E260121	6/4/2004 2:17:00 AM	Magnesium	Dissolved	52400	50000	105	91	111	pass
	D4E260121	6/1/2004 8:29:00 PM	Manganese	Dissolved	513	500	103	90	110	pass
	D4E260121	6/6/2004 12:37:00 PM	Mercury	Dissolved	4.68	5	94	84	114	pass
	D4E260121	6/1/2004 8:29:00 PM	Nickel	Dissolved	477	500	95	90	110	pass
	D4E260121	6/4/2004 2:17:00 AM	Potassium	Dissolved	50600	50000	101	86	111	pass
	D4E260121	6/1/2004 8:29:00 PM	Selenium	Dissolved	2110	2000	106	88	110	pass
	D4E260121	6/1/2004 8:29:00 PM	Silver	Dissolved	51.5	50	103	85	114	pass
	D4E260121	6/4/2004 2:17:00 AM	Sodium	Dissolved	51500	50000	103	91	112	pass
	D4E260121	6/19/2004 8:08:00 PM	Thallium	Dissolved	43.2	40	108	84	120	pass
	D4E260121	6/1/2004 8:29:00 PM	Vanadium	Dissolved	514	500	103	88	112	pass
	D4E260121	6/1/2004 8:29:00 PM	Zinc	Dissolved	477	500	95	85	110	pass
	D4E260121	6/4/2004 1:32:00 AM	Aluminum	Total	2100	2000	105	86	108	pass
	D4E260121	6/19/2004 1:02:00 PM	Antimony	Total	39.9	40	100	89	109	pass
	D4E260121	6/19/2004 1:02:00 PM	Arsenic	Total	39.3	40	98	87	109	pass
	D4E260121	6/1/2004 7:43:00 PM	Barium	Total	2110	2000	106	93	113	pass
	D4E260121	6/19/2004 1:02:00 PM	Beryllium	Total	40.9	40	102	86	115	pass
	D4E260121	6/19/2004 1:02:00 PM	Cadmium	Total	39.5	40	99	89	110	pass
	D4E260121	6/4/2004 1:32:00 AM	Calcium	Total	51900	50000	104	89	110	pass
	D4E260121	6/1/2004 7:43:00 PM	Chromium	Total	197	200	98	89	112	pass
	D4E260121	6/1/2004 7:43:00 PM	Cobalt	Total	477	500	95	86	107	pass
	D4E260121	6/1/2004 7:43:00 PM	Copper	Total	260	250	104	86	110	pass
	D4E260121	6/4/2004 1:32:00 AM	Iron	Total	1070	1000	107	88	110	pass
	D4E260121	6/1/2004 7:43:00 PM	Lead	Total	486	500	97	91	111	pass
	D4E260121	6/4/2004 1:32:00 AM	Magnesium	Total	52600	50000	105	91	111	pass
	D4E260121	6/1/2004 7:43:00 PM	Manganese	Total	500	500	100	90	110	pass
	D4E260121	6/6/2004 2:05:00 PM	Mercury	Total	4.96	5	99	84	114	pass
	D4E260121	6/1/2004 7:43:00 PM	Nickel	Total	466	500	93	90	110	pass
	D4E260121	6/4/2004 1:32:00 AM	Potassium	Total	50700	50000	101	86	111	pass

Table E-6. Data Quality Assessment
Evaluation of Laboratory Control Sample (LCS) Results

B. GROUNDWATER

Lab Sample ID	Sample Analysis Lot	Analysis Date/Time	Anayte	Analyte Type	Result (ug/L)	Spike Amount	Percent Recovery (%)	Lower Limit (%)	Upper Limit (%)	QC Acceptance Criteria Evaluation
	D4E260121	6/1/2004 7:43:00 PM	Selenium	Total	2020	2000	101	88	110	pass
	D4E260121	6/1/2004 7:43:00 PM	Silver	Total	50.3	50	101	85	114	pass
	D4E260121	6/4/2004 1:32:00 AM	Sodium	Total	52200	50000	104	91	112	pass
	D4E260121	6/19/2004 1:02:00 PM	Thallium	Total	42.2	40	105	84	120	pass
	D4E260121	6/1/2004 7:43:00 PM	Vanadium	Total	501	500	100	88	112	pass
	D4E260121	6/1/2004 7:43:00 PM	Zinc	Total	455	500	91	85	110	pass
	D4G010356	7/22/2004 2:48:00 AM	Aluminum	Dissolved	2040	2000	102	86	108	pass
	D4G010356	7/12/2004 7:45:00 PM	Antimony	Dissolved	39.2	40	98	89	109	pass
	D4G010356	7/12/2004 7:45:00 PM	Arsenic	Dissolved	37.9	40	95	87	109	pass
	D4G010356	7/13/2004 3:46:00 AM	Barium	Dissolved	2080	2000	104	93	113	pass
	D4G010356	7/12/2004 7:45:00 PM	Beryllium	Dissolved	40.7	40	102	86	115	pass
	D4G010356	7/12/2004 7:45:00 PM	Cadmium	Dissolved	38.9	40	97	89	110	pass
	D4G010356	7/22/2004 2:48:00 AM	Calcium	Dissolved	50200	50000	100	89	110	pass
	D4G010356	7/13/2004 3:46:00 AM	Chromium	Dissolved	210	200	105	89	112	pass
	D4G010356	7/13/2004 3:46:00 AM	Cobalt	Dissolved	510	500	102	86	107	pass
	D4G010356	7/13/2004 3:46:00 AM	Copper	Dissolved	251	250	100	86	110	pass
	D4G010356	7/22/2004 2:48:00 AM	Iron	Dissolved	978	1000	98	88	110	pass
	D4G010356	7/13/2004 3:46:00 AM	Lead	Dissolved	511	500	102	91	111	pass
	D4G010356	7/22/2004 2:48:00 AM	Magnesium	Dissolved	50300	50000	101	91	111	pass
	D4G010356	7/13/2004 3:46:00 AM	Manganese	Dissolved	525	500	105	90	110	pass
	D4G010356	7/14/2004 11:15:00 PM	Mercury	Dissolved	5.19	5	104	84	114	pass
	D4G010356	7/13/2004 3:46:00 AM	Nickel	Dissolved	516	500	103	90	110	pass
	D4G010356	7/22/2004 2:48:00 AM	Potassium	Dissolved	50000	50000	100	86	111	pass
	D4G010356	7/13/2004 3:46:00 AM	Selenium	Dissolved	2030	2000	102	88	110	pass
	D4G010356	7/13/2004 3:46:00 AM	Silver	Dissolved	54.2	50	108	85	114	pass
	D4G010356	7/22/2004 2:48:00 AM	Sodium	Dissolved	49600	50000	99	91	112	pass
	D4G010356	7/12/2004 7:45:00 PM	Thallium	Dissolved	39.5	40	99	84	120	pass
	D4G010356	7/13/2004 3:46:00 AM	Vanadium	Dissolved	521	500	104	88	112	pass
	D4G010356	7/22/2004 2:48:00 AM	Zinc	Dissolved	484	500	97	85	110	pass
	D4G010356	7/22/2004 1:52:00 AM	Aluminum	Total	2030	2000	101	86	108	pass
	D4G010356	7/12/2004 8:30:00 PM	Antimony	Total	40.9	40	102	89	109	pass
	D4G010356	7/12/2004 8:30:00 PM	Arsenic	Total	38.8	40	97	87	109	pass
	D4G010356	7/13/2004 2:45:00 AM	Barium	Total	2060	2000	103	93	113	pass
	D4G010356	7/12/2004 8:30:00 PM	Beryllium	Total	41.8	40	104	86	115	pass
	D4G010356	7/12/2004 8:30:00 PM	Cadmium	Total	39.5	40	99	89	110	pass
	D4G010356	7/22/2004 1:52:00 AM	Calcium	Total	50000	50000	100	89	110	pass
	D4G010356	7/13/2004 2:45:00 AM	Chromium	Total	207	200	103	89	112	pass
	D4G010356	7/13/2004 2:45:00 AM	Cobalt	Total	501	500	100	86	107	pass
	D4G010356	7/13/2004 2:45:00 AM	Copper	Total	245	250	98	86	110	pass
	D4G010356	7/22/2004 1:52:00 AM	Iron	Total	967	1000	97	88	110	pass
	D4G010356	7/13/2004 2:45:00 AM	Lead	Total	503	500	101	91	111	pass
	D4G010356	7/22/2004 1:52:00 AM	Magnesium	Total	50100	50000	100	91	111	pass
	D4G010356	7/13/2004 2:45:00 AM	Manganese	Total	515	500	103	90	110	pass
	D4G010356	7/14/2004 10:34:00 PM	Mercury	Total	4.81	5	96	84	114	pass
	D4G010356	7/13/2004 2:45:00 AM	Nickel	Total	509	500	102	90	110	pass
	D4G010356	7/22/2004 1:52:00 AM	Potassium	Total	50000	50000	100	86	111	pass

Table E-6. Data Quality Assessment
Evaluation of Laboratory Control Sample (LCS) Results

B. GROUNDWATER

Lab Sample ID	Sample Analysis Lot	Analysis Date/Time	Anayte	Analyte Type	Result (ug/L)	Spike Amount	Percent Recovery (%)	Lower Limit (%)	Upper Limit (%)	QC Acceptance Criteria Evaluation
	D4G010356	7/13/2004 2:45:00 AM	Selenium	Total	1970	2000	98	88	110	pass
	D4G010356	7/13/2004 2:45:00 AM	Silver	Total	53.3	50	107	85	114	pass
	D4G010356	7/22/2004 1:52:00 AM	Sodium	Total	49800	50000	100	91	112	pass
	D4G010356	7/12/2004 8:30:00 PM	Thallium	Total	39.6	40	99	84	120	pass
	D4G010356	7/13/2004 2:45:00 AM	Vanadium	Total	511	500	102	88	112	pass
	D4G010356	7/22/2004 1:52:00 AM	Zinc	Total	485	500	97	85	110	pass
	D4G280388	8/7/2004 5:23:00 AM	Aluminum	Dissolved	2080	2000	104	86	108	pass
	D4G280388	8/12/2004 9:59:00 PM	Antimony	Dissolved	39.5	40	99	89	109	pass
	D4G280388	8/12/2004 9:59:00 PM	Arsenic	Dissolved	39.4	40	98	87	109	pass
	D4G280388	8/6/2004 7:42:00 PM	Barium	Dissolved	2110	2000	106	93	113	pass
	D4G280388	8/12/2004 9:59:00 PM	Beryllium	Dissolved	40.8	40	102	86	115	pass
	D4G280388	8/12/2004 9:59:00 PM	Cadmium	Dissolved	39.9	40	100	89	110	pass
	D4G280388	8/7/2004 5:23:00 AM	Calcium	Dissolved	51800	50000	104	89	110	pass
	D4G280388	8/6/2004 7:42:00 PM	Chromium	Dissolved	211	200	106	89	112	pass
	D4G280388	8/6/2004 7:42:00 PM	Cobalt	Dissolved	506	500	101	86	107	pass
	D4G280388	8/6/2004 7:42:00 PM	Copper	Dissolved	242	250	97	86	110	pass
	D4G280388	8/7/2004 5:23:00 AM	Iron	Dissolved	1050	1000	105	88	110	pass
	D4G280388	8/6/2004 7:42:00 PM	Lead	Dissolved	521	500	104	91	111	pass
	D4G280388	8/7/2004 5:23:00 AM	Magnesium	Dissolved	53800	50000	108	91	111	pass
	D4G280388	8/6/2004 7:42:00 PM	Manganese	Dissolved	522	500	104	90	110	pass
	D4G280388	8/12/2004 1:20:00 PM	Mercury	Dissolved	5.46	5	109	84	114	pass
	D4G280388	8/6/2004 7:42:00 PM	Nickel	Dissolved	524	500	105	90	110	pass
	D4G280388	8/7/2004 5:23:00 AM	Potassium	Dissolved	51700	50000	103	86	111	pass
	D4G280388	8/6/2004 7:42:00 PM	Selenium	Dissolved	2080	2000	104	88	110	pass
	D4G280388	8/6/2004 7:42:00 PM	Silver	Dissolved	50	50	100	85	114	pass
	D4G280388	8/7/2004 5:23:00 AM	Sodium	Dissolved	54300	50000	109	91	112	pass
	D4G280388	8/12/2004 9:59:00 PM	Thallium	Dissolved	40.8	40	102	84	120	pass
	D4G280388	8/6/2004 7:42:00 PM	Vanadium	Dissolved	516	500	103	88	112	pass
	D4G280388	8/6/2004 7:42:00 PM	Zinc	Dissolved	525	500	105	85	110	pass
	D4G280388	8/6/2004 3:22:00 AM	Aluminum	Total	1990	2000	99	86	108	pass
	D4G280388	8/9/2004 5:38:00 PM	Antimony	Total	40.4	40	101	89	109	pass
	D4G280388	8/9/2004 5:38:00 PM	Arsenic	Total	39.4	40	98	87	109	pass
	D4G280388	8/4/2004 9:53:00 AM	Barium	Total	2070	2000	104	93	113	pass
	D4G280388	8/9/2004 5:38:00 PM	Beryllium	Total	43.4	40	109	86	115	pass
	D4G280388	8/9/2004 5:38:00 PM	Cadmium	Total	40.3	40	101	89	110	pass
	D4G280388	8/6/2004 3:22:00 AM	Calcium	Total	50100	50000	100	89	110	pass
	D4G280388	8/4/2004 9:53:00 AM	Chromium	Total	204	200	102	89	112	pass
	D4G280388	8/4/2004 9:53:00 AM	Cobalt	Total	499	500	100	86	107	pass
	D4G280388	8/4/2004 9:53:00 AM	Copper	Total	250	250	100	86	110	pass
	D4G280388	8/6/2004 3:22:00 AM	Iron	Total	1020	1000	102	88	110	pass
	D4G280388	8/4/2004 9:53:00 AM	Lead	Total	503	500	101	91	111	pass
	D4G280388	8/6/2004 3:22:00 AM	Magnesium	Total	51900	50000	104	91	111	pass
	D4G280388	8/4/2004 9:53:00 AM	Manganese	Total	508	500	102	90	110	pass
	D4G280388	8/13/2004 3:10:00 PM	Mercury	Total	5.16	5	103	84	114	pass
	D4G280388	8/4/2004 9:53:00 AM	Nickel	Total	502	500	100	90	110	pass
	D4G280388	8/6/2004 3:22:00 AM	Potassium	Total	50600	50000	101	86	111	pass

Table E-6. Data Quality Assessment
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Lab Sample ID	Sample Analysis Lot	Analysis Date/Time	Anayte	Analyte Type	Result (ug/L)	Spike Amount	Percent Recovery (%)	Lower Limit (%)	Upper Limit (%)	QC Acceptance Criteria Evaluation
	D4G280388	8/4/2004 9:53:00 AM	Selenium	Total	2060	2000	103	88	110	pass
	D4G280388	8/4/2004 9:53.00 AM	Silver	Total	50.6	50	101	85	114	pass
	D4G280388	8/6/2004 3:22:00 AM	Sodium	Total	51500	50000	103	91	112	pass
	D4G280388	8/9/2004 5:38:00 PM	Thallium	Total	44.1	40	110	84	120	pass
	D4G280388	8/4/2004 9:53:00 AM	Vanadium	Total	508	500	102	88	112	pass
	D4G280388	8/6/2004 3:22:00 AM	Zinc	Total	481	500	96	85	110	pass
D4K190000595C	D4K190487	11/23/2004 20:49	Aluminum	Total	2000	2000	100	86	108	pass
D4K190000595C	D4K190487	11/22/2004 19:36	Barium	Total	2040	2000	102	93	113	pass
D4K190000595C	D4K190487	11/23/2004 20:49	Calcium	Total	53000	50000	106	89	110	pass
D4K190000595C	D4K190487	11/22/2004 19:36	Chromium	Total	195	200	98	89	112	pass
D4K190000595C	D4K190487	11/22/2004 19:36	Cobalt	Total	471	500	94	86	107	pass
D4K190000595C	D4K190487	11/22/2004 19:36	Copper	Total	246	250	98	86	110	pass
D4K190000595C	D4K190487	11/23/2004 20:49	Iron	Total	1050	1000	105	88	110	pass
D4K190000595C	D4K190487	11/22/2004 19:36	Lead	Total	486	500	97	91	111	pass
D4K190000595C	D4K190487	11/23/2004 20:49	Magnesium	Total	53500	50000	107	91	111	pass
D4K190000595C	D4K190487	11/22/2004 19:36	Manganese	Total	486	500	97	90	110	pass
D4K190000595C	D4K190487	11/22/2004 19:36	Nickel	Total	488	500	98	90	110	pass
D4K190000595C	D4K190487	11/23/2004 20:49	Potassium	Total	52400	50000	105	86	111	pass
D4K190000595C	D4K190487	11/22/2004 19:36	Selenium	Total	1920	2000	96	88	110	pass
D4K190000595C	D4K190487	11/22/2004 19:36	Silver	Total	50.8	50	102	85	114	pass
D4K190000595C	D4K190487	11/23/2004 20:49	Sodium	Total	53400	50000	107	91	112	pass
D4K190000595C	D4K190487	11/22/2004 19:36	Vanadium	Total	492	500	98	88	112	pass
D4K190000595C	D4K190487	11/22/2004 19:36	Zinc	Total	459	500	92	85	110	pass
D4K190000614C	D4K190487	11/25/2004 11:53	Aluminum	Dissolved	1930	2000	97	86	108	pass
D4K190000614C	D4K190487	11/29/2004 13:27	Barium	Dissolved	2060	2000	103	93	113	pass
D4K190000614C	D4K190487	11/25/2004 11:53	Calcium	Dissolved	51800	50000	104	89	110	pass
D4K190000614C	D4K190487	11/29/2004 13:27	Chromium	Dissolved	203	200	101	89	112	pass
D4K190000614C	D4K190487	11/29/2004 13:27	Cobalt	Dissolved	491	500	98	86	107	pass
D4K190000614C	D4K190487	11/29/2004 13:27	Copper	Dissolved	250	250	100	86	110	pass
D4K190000614C	D4K190487	11/25/2004 11:53	Iron	Dissolved	998	1000	100	88	110	pass
D4K190000614C	D4K190487	11/29/2004 13:27	Lead	Dissolved	505	500	101	91	111	pass
D4K190000614C	D4K190487	11/25/2004 11:53	Magnesium	Dissolved	52200	50000	104	91	111	pass
D4K190000614C	D4K190487	11/25/2004 11:53	Manganese	Dissolved	493	500	99	90	110	pass
D4K190000614C	D4K190487	11/29/2004 13:27	Nickel	Dissolved	505	500	101	90	110	pass
D4K190000614C	D4K190487	11/25/2004 11:53	Potassium	Dissolved	53700	50000	107	86	111	pass
D4K190000614C	D4K190487	11/29/2004 13:27	Selenium	Dissolved	2010	2000	100	88	110	pass
D4K190000614C	D4K190487	11/29/2004 13:27	Silver	Dissolved	53.1	50	106	85	114	pass
D4K190000614C	D4K190487	11/25/2004 11:53	Sodium	Dissolved	52300	50000	105	91	112	pass
D4K190000614C	D4K190487	11/29/2004 13:27	Vanadium	Dissolved	506	500	101	88	112	pass
D4K190000614C	D4K190487	11/25/2004 11:53	Zinc	Dissolved	491	500	98	85	110	pass
D4K190000616C	D4K190487	12/1/2004 17:53	Antimony	Dissolved	40.9	40	102	89	109	pass
D4K190000616C	D4K190487	12/1/2004 17:53	Arsenic	Dissolved	41.7	40	104	87	109	pass
D4K190000616C	D4K190487	12/1/2004 17:53	Beryllium	Dissolved	42	40	105	86	115	pass
D4K190000616C	D4K190487	12/1/2004 17:53	Cadmium	Dissolved	42.2	40	105	89	110	pass
D4K190000616C	D4K190487	12/1/2004 17:53	Thallium	Dissolved	41.6	40	104	84	120	pass
D4K290000241C	D4K190487	12/1/2004 20:52	Antimony	Total	40.5	40	101	89	109	pass

Table E-6. Data Quality Assessment
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Lab Sample ID	Sample Analysis Lot	Analysis Date/Time	Anayte	Analyte Type	Result (ug/L)	Spike Amount	Percent Recovery (%)	Lower Limit (%)	Upper Limit (%)	QC Acceptance Criteria Evaluation
D4K290000241C	D4K190487	12/1/2004 20:52	Arsenic	Total	41.3	40	103	87	109	pass
D4K290000241C	D4K190487	12/1/2004 20:52	Beryllium	Total	42.6	40	106	86	115	pass
D4K290000241C	D4K190487	12/1/2004 20:52	Cadmium	Total	38.6	40	97	89	110	pass
D4K290000241C	D4K190487	12/1/2004 20:52	Thallium	Total	43.4	40	108	84	120	pass
D4K240000531C	D4K190487	11/30/2004 12:46	Mercury	Total	4.91	5	98	85	114	pass
D4K240000537C	D4K190487	12/2/2004 17:48	Mercury	Dissolved	5.25	5	105	85	114	pass
D5C290000583C	D5C280224	3/31/2005 0:31	Aluminum	Total	1960	2000	98	86	108	pass
D5C290000583C	D5C280224	3/30/2005 16:16	Barium	Total	2050	2000	103	93	113	pass
D5C290000583C	D5C280224	3/31/2005 0:31	Calcium	Total	51900	50000	104	89	110	pass
D5C290000583C	D5C280224	3/30/2005 16:16	Chromium	Total	205	200	103	89	112	pass
D5C290000583C	D5C280224	3/30/2005 16:16	Cobalt	Total	495	500	99	86	107	pass
D5C290000583C	D5C280224	3/30/2005 16:16	Copper	Total	247	250	99	86	110	pass
D5C290000583C	D5C280224	3/31/2005 0:31	Iron	Total	1050	1000	105	88	110	pass
D5C290000583C	D5C280224	3/30/2005 16:16	Lead	Total	497	500	99	91	111	pass
D5C290000583C	D5C280224	3/31/2005 0:31	Magnesium	Total	50200	50000	100	91	111	pass
D5C290000583C	D5C280224	3/30/2005 16:16	Manganese	Total	499	500	100	90	110	pass
D5C290000583C	D5C280224	3/30/2005 16:16	Nickel	Total	503	500	101	90	110	pass
D5C290000583C	D5C280224	3/31/2005 0:31	Potassium	Total	48300	50000	97	86	111	pass
D5C290000583C	D5C280224	3/30/2005 16:16	Selenium	Total	2020	2000	101	88	110	pass
D5C290000583C	D5C280224	3/30/2005 16:16	Silver	Total	53.1	50	106	85	114	pass
D5C290000583C	D5C280224	3/31/2005 0:31	Sodium	Total	50000	50000	100	91	112	pass
D5C290000583C	D5C280224	3/30/2005 16:16	Vanadium	Total	513	500	103	88	112	pass
D5C290000583C	D5C280224	3/30/2005 16:16	Zinc	Total	488	500	98	85	110	pass
D5C290000584C	D5C280224	3/30/2005 22:06	Antimony	Total	40.9	40	102	89	109	pass
D5C290000584C	D5C280224	3/30/2005 22:06	Arsenic	Total	40.1	40	100	87	109	pass
D5C290000584C	D5C280224	3/30/2005 22:06	Beryllium	Total	42.3	40	106	86	115	pass
D5C290000584C	D5C280224	3/30/2005 22:06	Cadmium	Total	40.6	40	101	89	110	pass
D5C290000584C	D5C280224	3/30/2005 22:06	Thallium	Total	42.4	40	106	84	120	pass
D5C290000109C	D5C280224	3/29/2005 17:53	Mercury	Total	4.86	5	97	85	114	pass
D5E040000197C	D5E020222	5/6/2005 21:59	Aluminum	Dissolved	2030	2000	102	86	108	pass
D5E040000197C	D5E020222	5/6/2005 12:17	Barium	Dissolved	2090	2000	104	93	113	pass
D5E040000197C	D5E020222	5/6/2005 21:59	Calcium	Dissolved	50800	50000	102	89	110	pass
D5E040000197C	D5E020222	5/6/2005 12:17	Chromium	Dissolved	200	200	100	89	112	pass
D5E040000197C	D5E020222	5/6/2005 12:17	Cobalt	Dissolved	487	500	97	86	107	pass
D5E040000197C	D5E020222	5/6/2005 12:17	Copper	Dissolved	245	250	98	86	110	pass
D5E040000197C	D5E020222	5/6/2005 21:59	Iron	Dissolved	1030	1000	103	88	110	pass
D5E040000197C	D5E020222	5/6/2005 12:17	Lead	Dissolved	493	500	99	91	111	pass
D5E040000197C	D5E020222	5/6/2005 21:59	Magnesium	Dissolved	51400	50000	103	91	111	pass
D5E040000197C	D5E020222	5/6/2005 12:17	Manganese	Dissolved	498	500	100	90	110	pass
D5E040000197C	D5E020222	5/6/2005 12:17	Nickel	Dissolved	497	500	99	90	110	pass
D5E040000197C	D5E020222	5/6/2005 21:59	Potassium	Dissolved	52000	50000	104	86	111	pass
D5E040000197C	D5E020222	5/6/2005 12:17	Selenium	Dissolved	1980	2000	99	88	110	pass
D5E040000197C	D5E020222	5/6/2005 12:17	Silver	Dissolved	52.7	50	105	85	114	pass
D5E040000197C	D5E020222	5/6/2005 21:59	Sodium	Dissolved	51700	50000	103	91	112	pass
D5E040000197C	D5E020222	5/6/2005 12:17	Vanadium	Dissolved	498	500	100	88	112	pass
D5E040000197C	D5E020222	5/6/2005 12:17	Zinc	Dissolved	471	500	94	85	110	pass

Table E-6. Data Quality Assessment
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Lab Sample ID	Sample Analysis Lot	Analysis Date/Time	Anayte	Analyte Type	Result (ug/L)	Spike Amount	Percent Recovery (%)	Lower Limit (%)	Upper Limit (%)	QC Acceptance Criteria Evaluation
D5E040000223C	D5E020222	5/6/2005 19:51	Aluminum	Total	2000	2000	100	86	108	pass
D5E040000223C	D5E020222	5/6/2005 15:08	Barium	Total	1960	2000	98	93	113	pass
D5E040000223C	D5E020222	5/6/2005 19:51	Calcium	Total	50000	50000	100	89	110	pass
D5E040000223C	D5E020222	5/6/2005 15:08	Chromium	Total	206	200	103	89	112	pass
D5E040000223C	D5E020222	5/6/2005 15:08	Cobalt	Total	503	500	101	86	107	pass
D5E040000223C	D5E020222	5/6/2005 15:08	Copper	Total	235	250	94	86	110	pass
D5E040000223C	D5E020222	5/6/2005 19:51	Iron	Total	1020	1000	102	88	110	pass
D5E040000223C	D5E020222	5/6/2005 15:08	Lead	Total	507	500	101	91	111	pass
D5E040000223C	D5E020222	5/6/2005 19:51	Magnesium	Total	50700	50000	101	91	111	pass
D5E040000223C	D5E020222	5/6/2005 15:08	Manganese	Total	507	500	101	90	110	pass
D5E040000223C	D5E020222	5/6/2005 15:08	Nickel	Total	507	500	101	90	110	pass
D5E040000223C	D5E020222	5/6/2005 19:51	Potassium	Total	51000	50000	102	86	111	pass
D5E040000223C	D5E020222	5/6/2005 15:08	Selenium	Total	1970	2000	99	88	110	pass
D5E040000223C	D5E020222	5/6/2005 15:08	Silver	Total	50.3	50	101	85	114	pass
D5E040000223C	D5E020222	5/6/2005 19:51	Sodium	Total	51300	50000	103	91	112	pass
D5E040000223C	D5E020222	5/6/2005 15:08	Vanadium	Total	508	500	102	88	112	pass
D5E040000223C	D5E020222	5/6/2005 19:51	Zinc	Total	483	500	97	85	110	pass
D5E040000643C	D5E020222	5/9/2005 22:12	Antimony	Dissolved	40.5	40	101	89	109	pass
D5E040000643C	D5E020222	5/9/2005 22:12	Arsenic	Dissolved	39.4	40	99	87	109	pass
D5E040000643C	D5E020222	5/9/2005 22:12	Beryllium	Dissolved	42	40	105	86	115	pass
D5E040000643C	D5E020222	5/9/2005 22:12	Cadmium	Dissolved	39.4	40	98	89	110	pass
D5E040000643C	D5E020222	5/9/2005 22:12	Thallium	Dissolved	40.9	40	102	84	120	pass
D5E040000644C	D5E020222	5/9/2005 23:10	Antimony	Total	39.5	40	99	89	109	pass
D5E040000644C	D5E020222	5/9/2005 23:10	Arsenic	Total	37.5	40	94	87	109	pass
D5E040000644C	D5E020222	5/9/2005 23:10	Beryllium	Total	38.9	40	97	86	115	pass
D5E040000644C	D5E020222	5/9/2005 23:10	Cadmium	Total	38.2	40	95	89	110	pass
D5E040000644C	D5E020222	5/9/2005 23:10	Thallium	Total	40.9	40	102	84	120	pass
D5E090000233C	D5E020222	5/9/2005 17:51	Mercury	Total	5.03	5	101	85	114	pass
D5E090000238C	D5E020222	5/9/2005 17:27	Mercury	Dissolved	4.96	5	99	85	114	pass
D5I220000492C	D5I190220	9/27/2005 17:29	Aluminum	Dissolved	2080	2000	104	86	108	pass
D5I220000237C	D5I190220	9/26/2005 21:02	Aluminum	Total	1910	2000	96	86	108	pass
D5I220000527C	D5I190220	9/29/2005 2:27	Antimony	Dissolved	40.3	40	101	89	109	pass
D5I220000193C	D5I190220	9/27/2005 19:48	Antimony	Total	40.4	40	101	89	109	pass
D5I220000527C	D5I190220	9/29/2005 2:27	Arsenic	Dissolved	40	40	100	87	109	pass
D5I220000193C	D5I190220	9/27/2005 19:48	Arsenic	Total	38.4	40	96	87	109	pass
D5I220000492C	D5I190220	9/28/2005 2:55	Barium	Dissolved	2110	2000	106	93	113	pass
D5I220000237C	D5I190220	9/28/2005 8:03	Barium	Total	1980	2000	99	93	113	pass
D5I220000527C	D5I190220	9/29/2005 2:27	Beryllium	Dissolved	44.5	40	111	86	115	pass
D5I220000193C	D5I190220	9/27/2005 19:48	Beryllium	Total	41.5	40	104	86	115	pass
D5I220000527C	D5I190220	9/29/2005 2:27	Cadmium	Dissolved	39.5	40	99	89	110	pass
D5I220000193C	D5I190220	9/27/2005 19:48	Cadmium	Total	38.8	40	97	89	110	pass
D5I220000492C	D5I190220	9/27/2005 17:29	Calcium	Dissolved	51300	50000	103	89	110	pass
D5I220000237C	D5I190220	9/26/2005 21:02	Calcium	Total	46200	50000	92	89	110	pass
D5I220000492C	D5I190220	9/28/2005 2:55	Chromium	Dissolved	196	200	98	89	112	pass
D5I220000237C	D5I190220	9/28/2005 8:03	Chromium	Total	195	200	98	89	112	pass
D5I220000492C	D5I190220	9/28/2005 2:55	Cobalt	Dissolved	492	500	98	86	107	pass

Table E-6. Data Quality Assessment
Evaluation of Laboratory Control Sample (LCS) Results

B. GROUNDWATER

Lab Sample ID	Sample Analysis Lot	Analysis Date/Time	Anayte	Analyte Type	Result (ug/L)	Spike Amount	Percent Recovery (%)	Lower Limit (%)	Upper Limit (%)	QC Acceptance Criteria Evaluation
D5I220000237C	D5I190220	9/28/2005 8:03	Cobalt	Total	488	500	98	86	107	pass
D5I220000492C	D5I190220	9/28/2005 2:55	Copper	Dissolved	283	250	113	86	110	pass
D5I220000237C	D5I190220	9/28/2005 8:03	Copper	Total	249	250	100	86	110	pass
D5I220000492C	D5I190220	9/27/2005 17:29	Iron	Dissolved	1040	1000	104	88	110	pass
D5I220000237C	D5I190220	9/26/2005 21:02	Iron	Total	938	1000	94	88	110	pass
D5I220000492C	D5I190220	9/28/2005 2:55	Lead	Dissolved	496	500	99	91	111	pass
D5I220000237C	D5I190220	9/28/2005 8:03	Lead	Total	484	500	97	91	111	pass
D5I220000492C	D5I190220	9/27/2005 17:29	Magnesium	Dissolved	50700	50000	101	91	111	pass
D5I220000237C	D5I190220	9/26/2005 21:02	Magnesium	Total	47300	50000	95	91	111	pass
D5I220000492C	D5I190220	9/28/2005 2:55	Manganese	Dissolved	499	500	100	90	110	pass
D5I220000237C	D5I190220	9/28/2005 8:03	Manganese	Total	495	500	99	90	110	pass
D5I220000500C	D5I190220	9/23/2005 17:41	Mercury	Dissolved	4.97	5	99	85	114	pass
D5I260000235C	D5I190220	9/26/2005 17:52	Mercury	Dissolved	4.95	5	99	85	114	pass
D5I260000218C	D5I190220	9/26/2005 17:15	Mercury	Total	4.92	5	98	85	114	pass
D5I220000522C	D5I190220	9/23/2005 18:53	Mercury	Total	5.08	5	102	85	114	pass
D5I220000492C	D5I190220	9/28/2005 2:55	Nickel	Dissolved	493	500	99	90	110	pass
D5I220000237C	D5I190220	9/28/2005 8:03	Nickel	Total	482	500	96	90	110	pass
D5I220000492C	D5I190220	9/27/2005 17:29	Potassium	Dissolved	52500	50000	105	86	111	pass
D5I220000237C	D5I190220	9/26/2005 21:02	Potassium	Total	50100	50000	100	86	111	pass
D5I220000492C	D5I190220	9/28/2005 2:55	Selenium	Dissolved	2070	2000	104	88	110	pass
D5I220000237C	D5I190220	9/28/2005 8:03	Selenium	Total	2000	2000	100	88	110	pass
D5I220000492C	D5I190220	9/28/2005 2:55	Silver	Dissolved	52.2	50	104	85	114	pass
D5I220000237C	D5I190220	9/28/2005 8:03	Silver	Total	50.9	50	102	85	114	pass
D5I220000492C	D5I190220	9/27/2005 17:29	Sodium	Dissolved	52500	50000	105	91	112	pass
D5I220000237C	D5I190220	9/26/2005 21:02	Sodium	Total	48500	50000	97	91	112	pass
D5I220000527C	D5I190220	9/29/2005 2:27	Thallium	Dissolved	45.5	40	114	84	120	pass
D5I220000193C	D5I190220	9/27/2005 19:48	Thallium	Total	42.7	40	107	84	120	pass
D5I220000492C	D5I190220	9/28/2005 2:55	Vanadium	Dissolved	501	500	100	88	112	pass
D5I220000237C	D5I190220	9/28/2005 8:03	Vanadium	Total	497	500	99	88	112	pass
D5I220000492C	D5I190220	9/28/2005 2:55	Zinc	Dissolved	472	500	94	85	110	pass
D5I220000237C	D5I190220	9/28/2005 8:03	Zinc	Total	461	500	92	85	110	pass

Fail = Percent recovery does not meet QC acceptance criteria (recoveries are outside of documented historical lab acceptance limits for a chemical).
Pass = Percent recovery within QC acceptance criteria (recoveries are within documented historical lab acceptance limits for a chemical).
QC = Quality Control

Table E-7. Data Quality Assessment
Evaluation of Laboratory Duplicate Samples

A. SOIL

Lab ID		Sample ID		Lot ID		Analyzed		Anayte	Analyte Type	Result (mg/kg)					RPD (%)	QC Acceptance Criteria
MSD	MS	MSD	MS	MSD	MS	MSD	MS			MSD			MS			
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/29/2003 20:55	12/29/2003 20:51	Aluminum	Total	35400	mg/kg	NC MSB	30800	NC MSB	13.90%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Antimony	Total	16.3	mg/kg		17.4		6.53%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Arsenic	Total	200	mg/kg		193		3.56%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Barium	Total	1600	mg/kg	NC MSB	1630	NC MSB	1.86%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Beryllium	Total	4.69	mg/kg		4.31		8.44%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Cadmium	Total	4.46	mg/kg		4.25		4.82%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/29/2003 20:55	12/29/2003 20:51	Calcium	Total	17700	mg/kg		17900		1.12%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Chromium	Total	26.2	mg/kg		23.7		10.02%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Cobalt	Total	54.7	mg/kg		50.8		7.39%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Copper	Total	38.6	mg/kg		35.6		8.09%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/29/2003 20:55	12/29/2003 20:51	Iron	Total	21600	mg/kg	NC MSB	19100	NC MSB	12.29%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Lead	Total	54.2	mg/kg		51.9		4.34%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/29/2003 20:55	12/29/2003 20:51	Magnesium	Total	9160	mg/kg		8280		10.09%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Manganese	Total	392	mg/kg	NC MSB	340	NC MSB	14.21%	pass
D3L100414001D	D3L100414001S	01-VBOU3-SB-0028-A	D3L100414001S	D3L100414	D3L100414	12/19/2003 8:34	12/18/2003 15:28	Mercury	Total	0.807	mg/kg	*	0.653	N	21.10%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/18/2003 16:32	12/18/2003 16:30	Mercury	Total	0.286	mg/kg	N *	0.516	N	57.36%	fail
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Nickel	Total	49.6	mg/kg		46.7		6.02%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/29/2003 20:55	12/29/2003 20:51	Potassium	Total	6290	mg/kg		5870		6.91%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Selenium	Total	188	mg/kg		182		3.24%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Silver	Total	4.97	mg/kg		4.69		5.80%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/29/2003 20:55	12/29/2003 20:51	Sodium	Total	7090	mg/kg		7180		1.26%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Thallium	Total	179	mg/kg		173		3.41%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Vanadium	Total	91.5	mg/kg		83.8		8.78%	pass
D3L100414018D	D3L100414018S	01-VBOU3-SB-0016-B	D3L100414018S	D3L100414	D3L100414	12/19/2003 13:12	12/19/2003 13:08	Zinc	Total	92.9	mg/kg		83.7	N	10.42%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/28/2003 21:05	12/28/2003 21:01	Aluminum	Total	15700	mg/kg	NC MSB	15300	NC MSB	2.58%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19:09	12/19/2003 19:04	Antimony	Total	22.4	mg/kg		22.7		1.33%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19:09	12/19/2003 19:04	Arsenic	Total	189	mg/kg		189		0.00%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19:09	12/19/2003 19:04	Barium	Total	317	mg/kg		307		3.21%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19:09	12/19/2003 19:04	Beryllium	Total	4.63	mg/kg		4.65		0.43%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19:09	12/19/2003 19:04	Cadmium	Total	4.59	mg/kg		4.6		0.22%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/28/2003 21:05	12/28/2003 21:01	Calcium	Total	7840	mg/kg		7980		1.77%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19:09	12/19/2003 19:04	Chromium	Total	31.3	mg/kg		30.9		1.29%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19:09	12/19/2003 19:04	Cobalt	Total	49.6	mg/kg		49.5		0.20%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19:09	12/19/2003 19:04	Copper	Total	58.8	mg/kg	NC MSB	72.4	NC MSB	20.73%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/28/2003 21:05	12/28/2003 21:01	Iron	Total	14400	mg/kg	NC MSB	13300	NC MSB	7.94%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19:09	12/19/2003 19:04	Lead	Total	72.4	mg/kg	N	76.8	N	5.90%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/28/2003 21:05	12/28/2003 21:01	Magnesium	Total	7180	mg/kg		7060		1.69%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19:09	12/19/2003 19:04	Manganese	Total	237	mg/kg		251		5.74%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19:09	12/19/2003 19:04	Nickel	Total	50.5	mg/kg		50.6		0.20%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/28/2003 21:05	12/28/2003 21:01	Potassium	Total	7680	mg/kg		7510		2.24%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19:09	12/19/2003 19:04	Selenium	Total	196	mg/kg		196		0.00%	pass

Table E-7. Data Quality Assessment
Evaluation of Laboratory Duplicate Samples

A. SOIL

Lab ID		Sample ID		Lot ID		Analyzed		Anayte	Analyte Type	Result (mg/kg)					RPD (%)	QC Acceptance Criteria
MSD	MS	MSD	MS	MSD	MS	MSD	MS			MSD			MS			
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19:09	12/19/2003 19.04	Silver	Total	4.75	mg/kg		4.81		1.26%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/28/2003 21.05	12/28/2003 21.01	Sodium	Total	4530	mg/kg		4710		3.90%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19.09	12/19/2003 19.04	Thallium	Total	184	mg/kg		184		0.00%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19.09	12/19/2003 19:04	Vanadium	Total	73.2	mg/kg		70.9		3.19%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/19/2003 19:09	12/19/2003 19:04	Zinc	Total	80.6	mg/kg		80.7		0.12%	pass
D3L110408001D	D3L110408001S	01-VBOU3-SB-0020-A	D3L110408001S	D3L110408	D3L110408	12/18/2003 8.56	12/17/2003 17:40	Mercury	Total	0.781	mg/kg		0.787		0.77%	pass
D3L110408016D	D3L110408016S	01-VBOU3-SB-0018-A	D3L110408016S	D3L110408	D3L110408	12/18/2003 16.52	12/18/2003 16:50	Mercury	Total	0.748	mg/kg		0.769		2.77%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/30/2003 0:36	12/30/2003 0.32	Aluminum	Total	34000	mg/kg	NC MSB	36000	NC MSB	5.71%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0:15	12/23/2003 0:11	Antimony	Total	17.5	mg/kg		17.3		1.15%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0:15	12/23/2003 0:11	Arsenic	Total	206	mg/kg		208		0.97%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0:15	12/23/2003 0.11	Barium	Total	528	mg/kg		456		14.63%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0.15	12/23/2003 0:11	Beryllium	Total	5.3	mg/kg		5.37		1.31%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0.15	12/23/2003 0.11	Cadmium	Total	5.34	mg/kg		5.27		1.32%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/30/2003 0.36	12/30/2003 0.32	Calcium	Total	20100	mg/kg		18600		7.75%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0:15	12/23/2003 0:11	Chromium	Total	35	mg/kg		34		2.90%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0:15	12/23/2003 0:11	Cobalt	Total	59.4	mg/kg		59.6		0.34%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0:15	12/23/2003 0:11	Copper	Total	88.5	mg/kg		90.6		2.35%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/30/2003 0.36	12/30/2003 0:32	Iron	Total	23400	mg/kg	NC MSB	26500	NC MSB	12.42%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0:15	12/23/2003 0:11	Lead	Total	203	mg/kg	N *	93.5		73.86%	fail
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/30/2003 0.36	12/30/2003 0:32	Magnesium	Total	9230	mg/kg		9790		5.89%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0:15	12/23/2003 0:11	Manganese	Total	549	mg/kg	NC MSB	458	NC MSB	18.07%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 14:56	12/23/2003 14:50	Mercury	Total	0.853	mg/kg		0.886		3.80%	pass
D3L190390019D	D3L190390019S	01-VBOU3-SB-0009-C	D3L190390019S	D3L190390	D3L190390	12/27/2003 21:26	12/27/2003 21:24	Mercury	Total	0.883	mg/kg		0.88		0.34%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0:15	12/23/2003 0:11	Nickel	Total	57.9	mg/kg		57.4		0.87%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/30/2003 0:36	12/30/2003 0:32	Potassium	Total	7750	mg/kg		7750		0.00%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0:15	12/23/2003 0:11	Selenium	Total	201	mg/kg		202		0.50%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0:15	12/23/2003 0:11	Silver	Total	5.86	mg/kg		5.87		0.17%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/30/2003 0:36	12/30/2003 0:32	Sodium	Total	5580	mg/kg		5790		3.69%	pass

Table E-7. Data Quality Assessment
Evaluation of Laboratory Duplicate Samples

A. SOIL

Lab ID		Sample ID		Lot ID		Analyzed		Anayte	Analyte Type	Result (mg/kg)					RPD (%)	QC Acceptance Criteria
MSD	MS	MSD	MS	MSD	MS	MSD	MS			MSD			MS			
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0:15	12/23/2003 0:11	Thallium	Total	190	mg/kg		191		0.52%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0:15	12/23/2003 0:11	Vanadium	Total	101	mg/kg		104		2.93%	pass
D3L190390004D	D3L190390004S	01-VBOU3-SB-0027-B	D3L190390004S	D3L190390	D3L190390	12/23/2003 0:15	12/23/2003 0:11	Zinc	Total	186	mg/kg		166	N	11.36%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/30/2003 4:49	12/30/2003 4:45	Aluminum	Total	26000	mg/kg	NC MSB	25100	NC MSB	3.52%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Antimony	Total	20.4	mg/kg		20.8		1.94%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Arsenic	Total	207	mg/kg		211		1.91%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Barium	Total	359	mg/kg		364		1.38%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Beryllium	Total	5.16	mg/kg		5.17		0.19%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Cadmium	Total	294	mg/kg	NC MSB	271	NC MSB	8.14%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/30/2003 4:49	12/30/2003 4:45	Calcium	Total	10400	mg/kg	N	11000	N	5.61%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Chromium	Total	35.3	mg/kg		34.7		1.71%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Cobalt	Total	54	mg/kg		54.6		1.10%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Copper	Total	115	mg/kg		130	N	12.24%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/30/2003 4:49	12/30/2003 4:45	Iron	Total	22500	mg/kg	NC MSB	21900	NC MSB	2.70%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Lead	Total	82.4	mg/kg		88.4		7.03%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/30/2003 4:49	12/30/2003 4:45	Magnesium	Total	8840	mg/kg		8780		0.68%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Manganese	Total	364	mg/kg	NC MSB	407	NC MSB	11.15%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 16:30	12/23/2003 16:24	Mercury	Total	0.829	mg/kg		0.8		3.56%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Nickel	Total	58.4	mg/kg		58.7		0.51%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/30/2003 4:49	12/30/2003 4:45	Potassium	Total	8850	mg/kg		8700		1.71%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Selenium	Total	199	mg/kg		203		1.99%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Silver	Total	6.1	mg/kg		6.32		3.54%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/30/2003 4:49	12/30/2003 4:45	Sodium	Total	6050	mg/kg		5850		3.36%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Thallium	Total	195	mg/kg		199		2.03%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/23/2003 20:58	12/23/2003 20:53	Vanadium	Total	92	mg/kg		90.3		1.87%	pass
D3L190405016D	D3L190405016S	01-VBOU3-SB-0007-D	D3L190405016S	D3L190405	D3L190405	12/28/2003 0:09	12/28/2003 0:04	Zinc	Total	3470	mg/kg	NC MSB	3470	NC MSB	0.00%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	1/5/2004 1:21	1/5/2004 1:16	Aluminum	Total	12200	mg/kg	NC MSB	11100	NC MSB	9.44%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Antimony	Total	26.8	mg/kg		29.2		8.57%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Arsenic	Total	209	mg/kg		210		0.48%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Barium	Total	426	mg/kg		370		14.07%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Beryllium	Total	4.84	mg/kg		4.9		1.23%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Cadmium	Total	9.28	mg/kg		9.51		2.45%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	1/5/2004 1:21	1/5/2004 1:16	Calcium	Total	12000	mg/kg		11300		6.01%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Chromium	Total	28.8	mg/kg		29.5		2.40%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Cobalt	Total	51	mg/kg		51.7		1.36%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Copper	Total	482	mg/kg	NC MSB	537	NC MSB	10.79%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	1/5/2004 1:21	1/5/2004 1:16	Iron	Total	16900	mg/kg	NC MSB	14000	NC MSB	18.77%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Lead	Total	383	mg/kg	N	352	N	8.44%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	1/5/2004 1:21	1/5/2004 1:16	Magnesium	Total	6960	mg/kg		6910		0.72%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Manganese	Total	269	mg/kg		243		10.16%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/31/2003 12:20	12/31/2003 12:19	Mercury	Total	0.941	mg/kg		0.952		1.16%	pass

Table E-7. Data Quality Assessment
Evaluation of Laboratory Duplicate Samples

A. SOIL

Lab ID		Sample ID		Lot ID		Analyzed		Anayte	Analyte Type	Result (mg/kg)					RPD (%)	QC Acceptance Criteria
MSD	MS	MSD	MS	MSD	MS	MSD	MS			MSD			MS			
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Nickel	Total	55.1	mg/kg		55.7		1.08%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	1/5/2004 1:21	1/5/2004 1:16	Potassium	Total	6120	mg/kg		6050		1.15%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Selenium	Total	196	mg/kg		196		0.00%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Silver	Total	9.08	mg/kg		8.73		3.93%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	1/5/2004 1:21	1/5/2004 1:16	Sodium	Total	5080	mg/kg		5100		0.39%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Thallium	Total	182	mg/kg		185		1.63%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	12/30/2003 18:28	12/30/2003 18:24	Vanadium	Total	70.6	mg/kg		72.8		3.07%	pass
D3L190419001D	D3L190419001S	01-VBOU3-SB-0004-A	D3L190419001S	D3L190419	D3L190419	1/5/2004 1:21	1/5/2004 1:16	Zinc	Total	411	mg/kg	NC MSB	424	NC MSB	3.11%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	1/5/2004 7:28	1/5/2004 7:24	Aluminum	Total	40900	mg/kg	NC MSB	30100	NC MSB	30.42%	fail
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Antimony	Total	17.6	mg/kg		16.9		4.06%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Arsenic	Total	192	mg/kg		187		2.64%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Barium	Total	310	mg/kg		337		8.35%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Beryllium	Total	5.65	mg/kg		5.5		2.69%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Cadmium	Total	5.02	mg/kg		5.57		10.39%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	1/5/2004 7:28	1/5/2004 7:24	Calcium	Total	12300	mg/kg		10500		15.79%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Chromium	Total	37	mg/kg		34.7		6.42%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Cobalt	Total	56.6	mg/kg		55.7		1.60%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Copper	Total	45.3	mg/kg		46.1		1.75%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	1/5/2004 7:28	1/5/2004 7:24	Iron	Total	29200	mg/kg	NC MSB	22100	NC MSB	27.68%	fail
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Lead	Total	101	mg/kg		110		8.53%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	1/5/2004 7:28	1/5/2004 7:24	Magnesium	Total	9660	mg/kg		8670		10.80%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Manganese	Total	774	mg/kg	NC MSB	603	NC MSB	24.84%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 14:08	12/31/2003 14:06	Mercury	Total	0.789	mg/kg		0.802		1.63%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Nickel	Total	58.2	mg/kg		56.6		2.79%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	1/5/2004 7:28	1/5/2004 7:24	Potassium	Total	7020	mg/kg		6950		1.00%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Selenium	Total	193	mg/kg		188		2.62%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Silver	Total	5.34	mg/kg		5.11		4.40%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	1/5/2004 7:28	1/5/2004 7:24	Sodium	Total	5580	mg/kg		5160		7.82%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Thallium	Total	184	mg/kg		180		2.20%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	12/31/2003 22:28	12/31/2003 22:23	Vanadium	Total	102	mg/kg		89.2		13.39%	pass
D3L190461009D	D3L190461009S	01-VBOU3-SB-0026-B	D3L190461009S	D3L190461	D3L190461	1/5/2004 7:28	1/5/2004 7:24	Zinc	Total	138	mg/kg		149		7.67%	pass

Table E-7. Data Quality Assessment
Evaluation of Laboratory Duplicate Samples

A. SOIL

Lab ID		Sample ID		Lot ID		Analyzed		Anayte	Analyte Type	Result (mg/kg)					RPD (%)	QC Acceptance Criteria
MSD	MS	MSD	MS	MSD	MS	MSD	MS			MSD			MS			
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/5/2004 6:00	1/5/2004 5:55	Aluminum	Total	22100	mg/kg	NC MSB	29400	NC MSB	28.35%	fail
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/1/2004 1:13	1/1/2004 1:09	Antimony	Total	19.5	mg/kg		19.2		1.55%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/1/2004 1.13	1/1/2004 1:09	Arsenic	Total	197	mg/kg		194		1.53%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/1/2004 1.13	1/1/2004 1:09	Barium	Total	280	mg/kg		299		6.56%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/1/2004 1:13	1/1/2004 1:09	Beryllium	Total	5.08	mg/kg		5.17		1.76%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/1/2004 1:13	1/1/2004 1:09	Cadmium	Total	4.82	mg/kg		4.68		2.95%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/5/2004 6:00	1/5/2004 5:55	Calcium	Total	10700	mg/kg		12000		11.45%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/1/2004 1:13	1/1/2004 1:09	Chromium	Total	33.9	mg/kg		37.7		10.61%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/1/2004 1:13	1/1/2004 1:09	Cobalt	Total	52.4	mg/kg		53.5		2.08%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/1/2004 1:13	1/1/2004 1:09	Copper	Total	53.6	mg/kg		53.3		0.56%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/5/2004 6:00	1/5/2004 5:55	Iron	Total	14500	mg/kg	NC MSB	19600	NC MSB	29.91%	fail
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/1/2004 1:13	1/1/2004 1:09	Lead	Total	88.7	mg/kg		83.4		6.16%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/5/2004 6:00	1/5/2004 5:55	Magnesium	Total	7370	mg/kg		8810		17.80%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/5/2004 6:00	1/5/2004 5:55	Manganese	Total	285	mg/kg	NC MSB	342	NC MSB	18.18%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/1/2004 1:13	1/1/2004 1:09	Nickel	Total	57.6	mg/kg		58.6		1.72%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/5/2004 6:00	1/5/2004 5:55	Potassium	Total	6340	mg/kg		7350		14.76%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/1/2004 1:13	1/1/2004 1:09	Selenium	Total	203	mg/kg		199		1.99%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/1/2004 1:13	1/1/2004 1:09	Silver	Total	5.2	mg/kg		5.24		0.77%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/5/2004 6:00	1/5/2004 5:55	Sodium	Total	4750	mg/kg		5110		7.30%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/1/2004 1:13	1/1/2004 1:09	Thallium	Total	193	mg/kg		189		2.09%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/1/2004 1:13	1/1/2004 1:09	Vanadium	Total	83	mg/kg		94.1		12.54%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	1/5/2004 6:00	1/5/2004 5:55	Zinc	Total	114	mg/kg	N	135		16.87%	pass
D3L190464018D	D3L190464018S	01-VBOU3-SB-0023-A	D3L190464018S	D3L190464	D3L190464	12/31/2003 15:09	12/31/2003 15:07	Mercury	Total	0.774	mg/kg		0.765		1.17%	pass

Fail = Relative Percent Difference (RPD) does not meet QC acceptance criteria (RPD>20%).
* RPD is outside percent control limits.
N = Spiked recovery outside QC control limits.
NC MSB = Not calculated. Parent sample concentrations greater than four times the spiked amounts.
NA = QC acceptance criteria not evaluated. Matrix spike and Matrix spike duplicate could not be compared, as parent sample concentration was 4 times the spike amount.
Pass = Relative Percent Difference (RPD) is within QC acceptance criteria (RPD<20%).
QC = Quality Control

Table E-7. Data Quality Assessment
Evaluation of Laboratory Duplicate Samples

B. WATER

Lab ID		Sample ID		Lot ID		Analyzed		Anayte	Analyte Type	Result (ug/L)			RPD (%)	QC Acceptance Criteria
MSD	MS	MSD	MS	MSD	MS	MSD	MS			MSD		MS		
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/22/2003 15:02	12/22/2003 14:58	Aluminum	Total	2530	ug/L	2490	1.59%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/19/2003 3:22	12/19/2003 3:19	Antimony	Total	41.3	ug/L	42	1.68%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/19/2003 3:22	12/19/2003 3:19	Arsenic	Total	39.1	ug/L	39.6	1.27%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/16/2003 11:43	12/16/2003 11:38	Barium	Total	2080	ug/L	2110	1.43%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/19/2003 3:22	12/19/2003 3:19	Beryllium	Total	38.5	ug/L	38.1	1.04%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/19/2003 3:22	12/19/2003 3:19	Cadmium	Total	40.4	ug/L	40.4	0.00%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/22/2003 15:02	12/22/2003 14:58	Calcium	Total	48100	ug/L	49800	3.47%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/16/2003 11:43	12/16/2003 11:38	Chromium	Total	216	ug/L	216	0.00%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/16/2003 11:43	12/16/2003 11:38	Cobalt	Total	509	ug/L	514	0.98%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/16/2003 11:43	12/16/2003 11:38	Copper	Total	249	ug/L	253	1.59%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/22/2003 15:02	12/22/2003 14:58	Iron	Total	1570	ug/L	1510	3.90%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/16/2003 11:43	12/16/2003 11:38	Lead	Total	506	ug/L	513	1.37%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/22/2003 15:02	12/22/2003 14:58	Magnesium	Total	48400	ug/L	50200	3.65%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/16/2003 11:43	12/16/2003 11:38	Manganese	Total	536	ug/L	539	0.56%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/16/2003 11:43	12/16/2003 11:38	Nickel	Total	512	ug/L	516	0.78%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/22/2003 15:02	12/22/2003 14:58	Potassium	Total	46600	ug/L	48300	3.58%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/16/2003 11:43	12/16/2003 11:38	Selenium	Total	1950	ug/L	1970	1.02%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/16/2003 11:43	12/16/2003 11:38	Silver	Total	48.2	ug/L	49.3	2.26%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/22/2003 15:02	12/22/2003 14:58	Sodium	Total	47200	ug/L	48600	2.92%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/19/2003 3:22	12/19/2003 3:19	Thallium	Total	42.3	ug/L	43.3	2.34%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/16/2003 11:43	12/16/2003 11:38	Vanadium	Total	535	ug/L	537	0.37%	pass
D3L110408021D	D3L110408021S	01-VBOU3-RIN-0002	D3L110408021S	D3L110408	D3L110408	12/16/2003 11:43	12/16/2003 11:38	Zinc	Total	486	ug/L	487	0.21%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/29/2003 7:48	12/29/2003 7:44	Aluminum	Total	2130	ug/L	2090	1.90%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/24/2003 6:34	12/24/2003 6:31	Antimony	Total	40.6	ug/L	42	3.39%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/24/2003 6:34	12/24/2003 6:31	Arsenic	Total	39	ug/L	39.3	0.77%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/23/2003 17:33	12/23/2003 17:29	Barium	Total	2160	ug/L	2120	1.87%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/24/2003 6:34	12/24/2003 6:31	Beryllium	Total	42.3	ug/L	42.3	0.00%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/24/2003 6:34	12/24/2003 6:31	Cadmium	Total	40.4	ug/L	40.5	0.25%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/29/2003 7:48	12/29/2003 7:44	Calcium	Total	51600	ug/L	50700	1.76%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/23/2003 17:33	12/23/2003 17:29	Chromium	Total	216	ug/L	214	0.93%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/23/2003 17:33	12/23/2003 17:29	Cobalt	Total	521	ug/L	514	1.35%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/23/2003 17:33	12/23/2003 17:29	Copper	Total	257	ug/L	252	1.96%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/29/2003 7:48	12/29/2003 7:44	Iron	Total	1200	ug/L	1180	1.68%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/23/2003 17:33	12/23/2003 17:29	Lead	Total	533	ug/L	526	1.32%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/29/2003 7:48	12/29/2003 7:44	Magnesium	Total	52600	ug/L	51500	2.11%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/23/2003 17:33	12/23/2003 17:29	Manganese	Total	528	ug/L	523	0.95%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/23/2003 17:33	12/23/2003 17:29	Nickel	Total	524	ug/L	518	1.15%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/29/2003 7:48	12/29/2003 7:44	Potassium	Total	52800	ug/L	51100	3.27%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/23/2003 17:33	12/23/2003 17:29	Selenium	Total	2100	ug/L	2070	1.44%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/23/2003 17:33	12/23/2003 17:29	Silver	Total	50.3	ug/L	49.5	1.60%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/29/2003 7:48	12/29/2003 7:44	Sodium	Total	52100	ug/L	49700	4.72%	pass

Table E-7. Data Quality Assessment
Evaluation of Laboratory Duplicate Samples

B. WATER

Lab ID		Sample ID		Lot ID		Analyzed		Anayte	Analyte Type	Result (ug/L)					RPD (%)	QC Acceptance Criteria
MSD	MS	MSD	MS	MSD	MS	MSD	MS			MSD			MS			
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/24/2003 6:34	12/24/2003 6:31	Thallium	Total	42.3	ug/L		41.7		1.43%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/23/2003 17:33	12/23/2003 17:29	Vanadium	Total	540	ug/L		535		0.93%	pass
D3L190390021D	D3L190390021S	01-VBOU3-RIN-0003	D3L190390021S	D3L190390	D3L190390	12/23/2003 17:33	12/23/2003 17:29	Zinc	Total	504	ug/L		501		0.60%	pass
		MW-31-072804	MW-31-072804	D4G280388	D4G280388	8/9/2004 6:19:00 PM	8/9/2004 6:15:00 PM	Antimony	Total	38.7	ug/L		39.7		2.55%	pass
		MW-31-072804	MW-31-072804	D4G280388	D4G280388	8/9/2004 6:19:00 PM	8/9/2004 6:15:00 PM	Arsenic	Total	37.5	ug/L		38.1		1.59%	pass
		MW-31-072804	MW-31-072804	D4G280388	D4G280388	8/9/2004 6:19:00 PM	8/9/2004 6:15:00 PM	Beryllium	Total	43.6	ug/L		43.3		0.69%	pass
		MW-31-072804	MW-31-072804	D4G280388	D4G280388	8/9/2004 6:19:00 PM	8/9/2004 6:15:00 PM	Cadmium	Total	38.6	ug/L		39.6		2.56%	pass
		MW-31-072804	MW-31-072804	D4G280388	D4G280388	8/9/2004 6:19:00 PM	8/9/2004 6:15:00 PM	Thallium	Total	44.5	ug/L		43.6		2.04%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/17/2004 8:42:00 PM	5/17/2004 8:39:00 PM	Antimony	Dissolved	39.8	ug/L		41.8		4.90%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/17/2004 8:42:00 PM	5/17/2004 8:39:00 PM	Arsenic	Dissolved	41.8	ug/L		44		5.13%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/17/2004 8:42:00 PM	5/17/2004 8:39:00 PM	Beryllium	Dissolved	41.8	ug/L		45.3		8.04%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/17/2004 8:42:00 PM	5/17/2004 8:39:00 PM	Cadmium	Dissolved	104	ug/L		110		5.61%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/17/2004 8:42:00 PM	5/17/2004 8:39:00 PM	Thallium	Dissolved	39.7	ug/L		41.5		4.43%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/15/2004 8:50:00 AM	5/15/2004 8:45:00 AM	Aluminum	Total	42300	ug/L	NC MSB	46400	NC MSB	9.24%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/18/2004 8:19:00 PM	5/18/2004 8:16:00 PM	Antimony	Total	13.7	ug/L	N	13.2	N	3.72%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/18/2004 8:19:00 PM	5/18/2004 8:16:00 PM	Arsenic	Total	47.1	ug/L		47.3		0.42%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/14/2004 10:29:00 PM	5/14/2004 10:25:00 PM	Barium	Total	2320	ug/L		2300		0.87%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/18/2004 8:19:00 PM	5/18/2004 8:16:00 PM	Beryllium	Total	42.2	ug/L		41.7		1.19%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/18/2004 8:19:00 PM	5/18/2004 8:16:00 PM	Cadmium	Total	132	ug/L	N	129		2.30%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/15/2004 8:50:00 AM	5/15/2004 8:45:00 AM	Calcium	Total	116000	ug/L		125000		7.47%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/14/2004 10:29:00 PM	5/14/2004 10:25:00 PM	Chromium	Total	222	ug/L		222		0.00%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/14/2004 10:29:00 PM	5/14/2004 10:25:00 PM	Cobalt	Total	528	ug/L		526		0.38%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/14/2004 10:29:00 PM	5/14/2004 10:25:00 PM	Copper	Total	349	ug/L		346		0.86%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/15/2004 8:50:00 AM	5/15/2004 8:45:00 AM	Iron	Total	29400	ug/L	NC MSB	32300	NC MSB	9.40%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/14/2004 10:29:00 PM	5/14/2004 10:25:00 PM	Lead	Total	496	ug/L		495		0.20%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/15/2004 8:50:00 AM	5/15/2004 8:45:00 AM	Magnesium	Total	58600	ug/L		63400		7.87%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/14/2004 10:29:00 PM	5/14/2004 10:25:00 PM	Manganese	Total	1760	ug/L		1770		0.57%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/14/2004 10:29:00 PM	5/14/2004 10:25:00 PM	Nickel	Total	519	ug/L		517		0.39%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/15/2004 8:50:00 AM	5/15/2004 8:45:00 AM	Potassium	Total	53700	ug/L		58400		8.39%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/14/2004 10:29:00 PM	5/14/2004 10:25:00 PM	Selenium	Total	1890	ug/L		1890		0.00%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/14/2004 10:29:00 PM	5/14/2004 10:25:00 PM	Silver	Total	50.6	ug/L		50		1.19%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/15/2004 8:50:00 AM	5/15/2004 8:45:00 AM	Sodium	Total	134000	ug/L		148000		9.93%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/18/2004 8:19:00 PM	5/18/2004 8:16:00 PM	Thallium	Total	43.3	ug/L		43.4		0.23%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/14/2004 10:29:00 PM	5/14/2004 10:25:00 PM	Vanadium	Total	533	ug/L		531		0.38%	pass
		MW-33-050304	MW-33-050304	D4E040112	D4E040112	5/14/2004 10:29:00 PM	5/14/2004 10:25:00 PM	Zinc	Total	1380	ug/L		1380		0.00%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/19/2004 8:27:00 PM	6/19/2004 8:23:00 PM	Antimony	Dissolved	41.3	ug/L		40		3.20%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/19/2004 8:27:00 PM	6/19/2004 8:23:00 PM	Arsenic	Dissolved	43.7	ug/L		42.8		2.08%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/19/2004 8:27:00 PM	6/19/2004 8:23:00 PM	Beryllium	Dissolved	46.2	ug/L		45.1		2.41%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/19/2004 8:27:00 PM	6/19/2004 8:23:00 PM	Cadmium	Dissolved	82.9	ug/L		80		3.56%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/19/2004 8:27:00 PM	6/19/2004 8:23:00 PM	Thallium	Dissolved	42.9	ug/L		41.3		3.80%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/4/2004 1:50:00 AM	6/4/2004 1:46:00 AM	Aluminum	Total	3280	ug/L	N	3240	N	1.23%	pass

Table E-7. Data Quality Assessment
Evaluation of Laboratory Duplicate Samples

B. WATER

Lab ID MSD	Lab ID MS	Sample ID MSD	Sample ID MS	Lot ID MSD	Lot ID MS	Analyzed MSD	Analyzed MS	Anayte	Analyte Type	Result (ug/L) MSD			Result (ug/L) MS		RPD (%)	QC Acceptance Criteria
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/1/2004 8:01:00 PM	6/1/2004 7:57:00 PM	Barium	Total	2110	ug/L		2110		0.00%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/4/2004 1:50:00 AM	6/4/2004 1:46:00 AM	Calcium	Total	117000	ug/L		117000		0.00%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/1/2004 8:01:00 PM	6/1/2004 7:57:00 PM	Chromium	Total	192	ug/L		192		0.00%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/1/2004 8:01:00 PM	6/1/2004 7:57:00 PM	Cobalt	Total	471	ug/L		471		0.00%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/1/2004 8:01:00 PM	6/1/2004 7:57:00 PM	Copper	Total	271	ug/L		270		0.37%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/4/2004 1:50:00 AM	6/4/2004 1:46:00 AM	Iron	Total	1710	ug/L		1690		1.18%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/1/2004 8:01:00 PM	6/1/2004 7:57:00 PM	Lead	Total	481	ug/L		479		0.42%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/4/2004 1:50:00 AM	6/4/2004 1:46:00 AM	Magnesium	Total	59000	ug/L		59200		0.34%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/1/2004 8:01:00 PM	6/1/2004 7:57:00 PM	Manganese	Total	539	ug/L		538		0.19%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/6/2004 2:11:00 PM	6/6/2004 2:09:00 PM	Mercury	Total	5.03	ug/L		5.04		0.20%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/1/2004 8:01:00 PM	6/1/2004 7:57:00 PM	Nickel	Total	463	ug/L		466		0.65%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/4/2004 1:50:00 AM	6/4/2004 1:46:00 AM	Potassium	Total	53600	ug/L		53900		0.56%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/1/2004 8:01:00 PM	6/1/2004 7:57:00 PM	Selenium	Total	2000	ug/L		2000		0.00%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/1/2004 8:01:00 PM	6/1/2004 7:57:00 PM	Silver	Total	49.9	ug/L		49.7		0.40%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/4/2004 1:50:00 AM	6/4/2004 1:46:00 AM	Sodium	Total	135000	ug/L		134000		0.74%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/1/2004 8:01:00 PM	6/1/2004 7:57:00 PM	Vanadium	Total	493	ug/L		492		0.20%	pass
		MW-33-052104	MW-33-052104	D4E260121	D4E260121	6/1/2004 8:01:00 PM	6/1/2004 7:57:00 PM	Zinc	Total	643	ug/L		642		0.16%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/22/2004 3:07:00 AM	7/22/2004 3:02:00 AM	Aluminum	Dissolved	2040	ug/L		2020		0.99%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/12/2004 8:04:00 PM	7/12/2004 8:00:00 PM	Antimony	Dissolved	41.7	ug/L		40.7		2.43%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/12/2004 8:04:00 PM	7/12/2004 8:00:00 PM	Arsenic	Dissolved	42.6	ug/L		42		1.42%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 4:06:00 AM	7/13/2004 4:01:00 AM	Barium	Dissolved	2100	ug/L		2080		0.96%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/12/2004 8:04:00 PM	7/12/2004 8:00:00 PM	Beryllium	Dissolved	43.3	ug/L		41.8		3.53%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/12/2004 8:04:00 PM	7/12/2004 8:00:00 PM	Cadmium	Dissolved	65.6	ug/L		64.4		1.85%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/22/2004 3:07:00 AM	7/22/2004 3:02:00 AM	Calcium	Dissolved	123000	ug/L		121000		1.64%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 4:06:00 AM	7/13/2004 4:01:00 AM	Chromium	Dissolved	207	ug/L		206		0.48%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 4:06:00 AM	7/13/2004 4:01:00 AM	Cobalt	Dissolved	515	ug/L		511		0.78%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 4:06:00 AM	7/13/2004 4:01:00 AM	Copper	Dissolved	260	ug/L		257		1.16%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/22/2004 3:07:00 AM	7/22/2004 3:02:00 AM	Iron	Dissolved	987	ug/L		974		1.33%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 4:06:00 AM	7/13/2004 4:01:00 AM	Lead	Dissolved	508	ug/L		507		0.20%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/22/2004 3:07:00 AM	7/22/2004 3:02:00 AM	Magnesium	Dissolved	57400	ug/L		56500		1.58%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 4:06:00 AM	7/13/2004 4:01:00 AM	Manganese	Dissolved	533	ug/L		530		0.56%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/14/2004 11:24:00 PM	7/14/2004 11:22:00 PM	Mercury	Dissolved	4.59	ug/L		5.28		13.98%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 4:06:00 AM	7/13/2004 4:01:00 AM	Nickel	Dissolved	514	ug/L		510		0.78%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/22/2004 3:07:00 AM	7/22/2004 3:02:00 AM	Potassium	Dissolved	52100	ug/L		51600		0.96%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 4:06:00 AM	7/13/2004 4:01:00 AM	Selenium	Dissolved	2020	ug/L		2000		1.00%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 4:06:00 AM	7/13/2004 4:01:00 AM	Silver	Dissolved	54.4	ug/L		53.7		1.30%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/22/2004 3:07:00 AM	7/22/2004 3:02:00 AM	Sodium	Dissolved	143000	ug/L		140000		2.12%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/12/2004 8:04:00 PM	7/12/2004 8:00:00 PM	Thallium	Dissolved	38.4	ug/L		37.6		2.11%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 4:06:00 AM	7/13/2004 4:01:00 AM	Vanadium	Dissolved	516	ug/L		513		0.58%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/22/2004 3:07:00 AM	7/22/2004 3:02:00 AM	Zinc	Dissolved	673	ug/L		664		1.35%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/22/2004 2:11:00 AM	7/13/2004 3:06:00 AM	Aluminum	Total	2850	ug/L	N	2820	N	1.06%	pass

Table E-7. Data Quality Assessment
Evaluation of Laboratory Duplicate Samples

B. WATER

Lab ID		Sample ID		Lot ID		Analyzed		Anayte	Analyte Type	Result (ug/L)				RPD (%)	QC Acceptance Criteria
MSD	MS	MSD	MS	MSD	MS	MSD	MS			MSD		MS			
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/12/2004 8:56:00 PM	7/12/2004 8:45:00 PM	Antimony	Total	41.2	ug/L	41.4		0.48%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/12/2004 8:56:00 PM	7/12/2004 8:45:00 PM	Arsenic	Total	42.4	ug/L	43		1.41%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 3:06:00 AM	7/13/2004 3:00:00 AM	Barium	Total	2160	ug/L	2170		0.46%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/12/2004 8:56:00 PM	7/12/2004 8:45:00 PM	Beryllium	Total	41	ug/L	42.7		4.06%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/12/2004 8:56:00 PM	7/12/2004 8:45:00 PM	Cadmium	Total	66	ug/L	66.2		0.30%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/22/2004 2:11:00 AM	7/22/2004 2:06:00 AM	Calcium	Total	125000	ug/L	126000		0.80%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 3:06:00 AM	7/13/2004 3:00:00 AM	Chromium	Total	212	ug/L	214		0.94%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 3:06:00 AM	7/13/2004 3:00:00 AM	Cobalt	Total	516	ug/L	520		0.77%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 3:06:00 AM	7/13/2004 3:00:00 AM	Copper	Total	267	ug/L	269		0.75%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/22/2004 2:11:00 AM	7/22/2004 2:06:00 AM	Iron	Total	1390	ug/L	1390		0.00%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 3:06:00 AM	7/13/2004 3:00:00 AM	Lead	Total	521	ug/L	522		0.19%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/22/2004 2:11:00 AM	7/22/2004 2:06:00 AM	Magnesium	Total	58900	ug/L	59300		0.68%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 3:06:00 AM	7/13/2004 3:00:00 AM	Manganese	Total	559	ug/L	562		0.54%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/14/2004 10:45:00 PM	7/14/2004 10:43:00 PM	Mercury	Total	4.76	ug/L	4.82		1.25%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 3:06:00 AM	7/13/2004 3:00:00 AM	Nickel	Total	524	ug/L	531		1.33%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/22/2004 2:11:00 AM	7/22/2004 2:06:00 AM	Potassium	Total	54400	ug/L	55000		1.10%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 3:06:00 AM	7/13/2004 3:00:00 AM	Selenium	Total	2020	ug/L	2030		0.49%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 3:06:00 AM	7/13/2004 3:00:00 AM	Silver	Total	55.7	ug/L	55.4		0.54%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/22/2004 2:11:00 AM	7/22/2004 2:06:00 AM	Sodium	Total	145000	ug/L	145000		0.00%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/12/2004 8:56:00 PM	7/12/2004 8:45:00 PM	Thallium	Total	37.5	ug/L	38.3		2.11%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/13/2004 3:06:00 AM	7/13/2004 3:00:00 AM	Vanadium	Total	528	ug/L	532		0.75%	pass
		MW-33-070104	MW-33-070104	D4G010356	D4G010356	7/22/2004 2:11:00 AM	7/22/2004 2:06:00 AM	Zinc	Total	703	ug/L	707		0.57%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/6/2004 3:54:00 AM	8/6/2004 3:50:00 AM	Aluminum	Total	2250	ug/L	2200		2.25%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/4/2004 10:28:00 AM	8/4/2004 10:23:00 AM	Barium	Total	2000	ug/L	2020		1.00%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/6/2004 3:54:00 AM	8/6/2004 3:50:00 AM	Calcium	Total	148000	ug/L	153000		3.32%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/4/2004 10:28:00 AM	8/4/2004 10:23:00 AM	Chromium	Total	210	ug/L	214		1.89%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/4/2004 10:28:00 AM	8/4/2004 10:23:00 AM	Cobalt	Total	511	ug/L	523		2.32%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/4/2004 10:28:00 AM	8/4/2004 10:23:00 AM	Copper	Total	250	ug/L	253		1.19%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/6/2004 3:54:00 AM	8/6/2004 3:50:00 AM	Iron	Total	1220	ug/L	1200		1.65%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/4/2004 10:28:00 AM	8/4/2004 10:23:00 AM	Lead	Total	519	ug/L	523		0.77%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/6/2004 3:54:00 AM	8/6/2004 3:50:00 AM	Magnesium	Total	61500	ug/L	62700		1.93%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/4/2004 10:28:00 AM	8/4/2004 10:23:00 AM	Manganese	Total	535	ug/L	547		2.22%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/4/2004 10:28:00 AM	8/4/2004 10:23:00 AM	Nickel	Total	517	ug/L	528		2.11%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/6/2004 3:54:00 AM	8/6/2004 3:50:00 AM	Potassium	Total	53800	ug/L	54600		1.48%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/4/2004 10:28:00 AM	8/4/2004 10:23:00 AM	Selenium	Total	2040	ug/L	2080		1.94%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/4/2004 10:28:00 AM	8/4/2004 10:23:00 AM	Silver	Total	51.2	ug/L	52		1.55%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/6/2004 3:54:00 AM	8/6/2004 3:50:00 AM	Sodium	Total	168000	ug/L	172000		2.35%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/4/2004 10:28:00 AM	8/4/2004 10:23:00 AM	Vanadium	Total	513	ug/L	524		2.12%	pass
		MW-33-072804	MW-33-072804	D4G280388	D4G280388	8/6/2004 3:54:00 AM	8/6/2004 3:50:00 AM	Zinc	Total	728	ug/L	745		2.31%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/4/2004 2:40:00 AM	6/4/2004 2:35:00 AM	Aluminum	Dissolved	2230	ug/L	2180		2.27%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/1/2004 8:53:00 PM	6/1/2004 8:48:00 PM	Barium	Dissolved	2140	ug/L	2090		2.36%	pass

Table E-7. Data Quality Assessment
Evaluation of Laboratory Duplicate Samples

B. WATER

Lab ID		Sample ID		Lot ID		Analyzed		Anayte	Analyte Type	Result (ug/L)					RPD (%)	QC Acceptance Criteria
MSD	MS	MSD	MS	MSD	MS	MSD	MS			MSD			MS			
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/4/2004 2:40:00 AM	6/4/2004 2:35:00 AM	Calcium	Dissolved	669000	ug/L	NC MSB	664000	NC MSB	0.75%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/1/2004 8:53:00 PM	6/1/2004 8:48:00 PM	Chromium	Dissolved	189	ug/L		186		1.60%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/1/2004 8:53:00 PM	6/1/2004 8:48:00 PM	Cobalt	Dissolved	476	ug/L		469		1.48%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/1/2004 8:53:00 PM	6/1/2004 8:48:00 PM	Copper	Dissolved	291	ug/L		283		2.79%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/4/2004 2:40:00 AM	6/4/2004 2:35:00 AM	Iron	Dissolved	1230	ug/L		1200		2.47%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/1/2004 8:53:00 PM	6/1/2004 8:48:00 PM	Lead	Dissolved	493	ug/L		484		1.84%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/4/2004 2:40:00 AM	6/4/2004 2:35:00 AM	Magnesium	Dissolved	110000	ug/L		109000		0.91%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/1/2004 8:53:00 PM	6/1/2004 8:48:00 PM	Manganese	Dissolved	1100	ug/L		1090		0.91%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/1/2004 8:53:00 PM	6/1/2004 8:48:00 PM	Nickel	Dissolved	482	ug/L		474		1.67%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/4/2004 2:40:00 AM	6/4/2004 2:35:00 AM	Potassium	Dissolved	69500	ug/L		67700		2.62%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/1/2004 8:53:00 PM	6/1/2004 8:48:00 PM	Selenium	Dissolved	2210	ug/L		2160		2.29%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/1/2004 8:53:00 PM	6/1/2004 8:48:00 PM	Silver	Dissolved	54.2	ug/L		53.7		0.93%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/4/2004 2:40:00 AM	6/4/2004 2:35:00 AM	Sodium	Dissolved	725000	ug/L	NC MSB	718000	NC MSB	0.97%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/1/2004 8:53:00 PM	6/1/2004 8:48:00 PM	Vanadium	Dissolved	485	ug/L		477		1.66%	pass
		MW-34-052104	MW-34-052104	D4E260121	D4E260121	6/1/2004 8:53:00 PM	6/1/2004 8:48:00 PM	Zinc	Dissolved	523	ug/L		515		1.54%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/25/04 12:12 PM	11/25/04 12:07 PM	Aluminum	Dissolved	2170	ug/L		2150		0.93%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	12/1/04 6:19 PM	12/1/04 6:08 PM	Antimony	Dissolved	44.3	ug/L		41.8		5.81%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	12/1/04 6:19 PM	12/1/04 6:08 PM	Arsenic	Dissolved	45.8	ug/L		43.9		4.24%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/29/04 1:48 PM	11/29/04 1:42 PM	Barium	Dissolved	2180	ug/L		2130		2.32%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	12/1/04 6:19 PM	12/1/04 6:08 PM	Beryllium	Dissolved	45.1	ug/L		42.6		5.70%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	12/1/04 6:19 PM	12/1/04 6:08 PM	Cadmium	Dissolved	93.1	ug/L		90		3.39%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/25/04 12:12 PM	11/25/04 12:07 PM	Calcium	Dissolved	283000	ug/L	NC MSB	281000	NC MSB	0.71%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/29/04 1:48 PM	11/29/04 1:42 PM	Chromium	Dissolved	202	ug/L		198		2.00%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/29/04 1:48 PM	11/29/04 1:42 PM	Cobalt	Dissolved	498	ug/L		489		1.82%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/29/04 1:48 PM	11/29/04 1:42 PM	Copper	Dissolved	269	ug/L		262		2.64%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/25/04 12:12 PM	11/25/04 12:07 PM	Iron	Dissolved	1130	ug/L		1110		1.79%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/29/04 1:48 PM	11/29/04 1:42 PM	Lead	Dissolved	521	ug/L		510		2.13%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/25/04 12:12 PM	11/25/04 12:07 PM	Magnesium	Dissolved	91200	ug/L		90600		0.66%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/25/04 12:12 PM	11/25/04 12:07 PM	Manganese	Dissolved	828	ug/L		822		0.73%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	12/2/04 5:58 PM	12/2/04 5:53 PM	Mercury	Dissolved	5.18	ug/L		5.46		5.26%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/29/04 1:48 PM	11/29/04 1:42 PM	Nickel	Dissolved	506	ug/L		497		1.79%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/25/04 12:12 PM	11/25/04 12:07 PM	Potassium	Dissolved	64900	ug/L		64400		0.77%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/29/04 1:48 PM	11/29/04 1:42 PM	Selenium	Dissolved	2160	ug/L		2110		2.34%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/29/04 1:48 PM	11/29/04 1:42 PM	Silver	Dissolved	55.3	ug/L		54.1		2.19%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/25/04 12:12 PM	11/25/04 12:07 PM	Sodium	Dissolved	307000	ug/L	NC MSB	306000	NC MSB	0.33%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	12/1/04 6:19 PM	12/1/04 6:08 PM	Thallium	Dissolved	41.1	ug/L		40.1		2.46%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/29/04 1:48 PM	11/29/04 1:42 PM	Vanadium	Dissolved	510	ug/L		500		1.98%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/25/04 12:12 PM	11/25/04 12:07 PM	Zinc	Dissolved	663	ug/L		657		0.91%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/23/04 9:22 PM	11/23/04 9:17 PM	Aluminum	Total	2480	ug/L		2500		0.80%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/22/04 8:51 PM	11/22/04 8:46 PM	Barium	Total	2120	ug/L		2070		2.39%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/23/04 9:22 PM	11/23/04 9:17 PM	Calcium	Total	293000	ug/L	NC MSB	292000	NC MSB	0.34%	pass

Table E-7. Data Quality Assessment
Evaluation of Laboratory Duplicate Samples

B. WATER

Lab ID		Sample ID		Lot ID		Analyzed		Anayte	Analyte Type	Result (ug/L)					RPD (%)	QC Acceptance Criteria
MSD	MS	MSD	MS	MSD	MS	MSD	MS			MSD			MS			
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/22/04 8:51 PM	11/22/04 8:46 PM	Chromium	Total	191	ug/L		189		1.05%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/22/04 8:51 PM	11/22/04 8:46 PM	Cobalt	Total	471	ug/L		466		1.07%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/22/04 8:51 PM	11/22/04 8:46 PM	Copper	Total	266	ug/L		260		2.28%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/23/04 9:22 PM	11/23/04 9:17 PM	Iron	Total	1310	ug/L		1330		1.52%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/22/04 8:51 PM	11/22/04 8:46 PM	Lead	Total	496	ug/L		485		2.24%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/23/04 9:22 PM	11/23/04 9:17 PM	Magnesium	Total	94000	ug/L		94300		0.32%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/22/04 8:51 PM	11/22/04 8:46 PM	Manganese	Total	1020	ug/L		989		3.09%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/30/04 12:55 PM	11/30/04 12:53 PM	Mercury	Total	5.02	ug/L		5.14		2.36%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/22/04 8:51 PM	11/22/04 8:46 PM	Nickel	Total	481	ug/L		475		1.26%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/23/04 9:22 PM	11/23/04 9:17 PM	Potassium	Total	63900	ug/L		64400		0.78%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/22/04 8:51 PM	11/22/04 8:46 PM	Selenium	Total	2080	ug/L		2020		2.93%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/22/04 8:51 PM	11/22/04 8:46 PM	Silver	Total	53	ug/L		52.3		1.33%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/23/04 9:22 PM	11/23/04 9:17 PM	Sodium	Total	319000	ug/L	NC MSB	318000	NC MSB	0.31%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/22/04 8:51 PM	11/22/04 8:46 PM	Vanadium	Total	494	ug/L		487		1.43%	pass
D4K190487001D	D4K190487001S	KP-GW-16-111904	KP-GW-16-111904	D4K190487	D4K190487	11/22/04 8:51 PM	11/22/04 8:46 PM	Zinc	Total	600	ug/L		595		0.84%	pass
D4K190487006D	D4K190487006S	KP-GW-46-111904A	KP-GW-46-111904A	D4K190487	D4K190487	12/1/04 9:11 PM	12/1/04 9:07 PM	Antimony	Total	44.2	ug/L	N	44.6	N	0.90%	pass
D4K190487006D	D4K190487006S	KP-GW-46-111904A	KP-GW-46-111904A	D4K190487	D4K190487	12/1/04 9:11 PM	12/1/04 9:07 PM	Arsenic	Total	44.5	ug/L	N	44.2		0.68%	pass
D4K190487006D	D4K190487006S	KP-GW-46-111904A	KP-GW-46-111904A	D4K190487	D4K190487	12/1/04 9:11 PM	12/1/04 9:07 PM	Beryllium	Total	50	ug/L	N	48	N	4.08%	pass
D4K190487006D	D4K190487006S	KP-GW-46-111904A	KP-GW-46-111904A	D4K190487	D4K190487	12/1/04 9:11 PM	12/1/04 9:07 PM	Cadmium	Total	63.3	ug/L		63		0.48%	pass
D4K190487006D	D4K190487006S	KP-GW-46-111904A	KP-GW-46-111904A	D4K190487	D4K190487	12/1/04 9:11 PM	12/1/04 9:07 PM	Thallium	Total	42.8	ug/L		41 9		2.13%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/31/05 12:51 AM	3/31/05 12:46 AM	Aluminum	Total	2080	ug/L		2110		1.43%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/30/05 4:37 PM	3/30/05 4:31 PM	Barium	Total	2090	ug/L		2080		0.48%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/31/05 12:51 AM	3/31/05 12:46 AM	Calcium	Total	123000	ug/L		123000		0.00%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/30/05 4:37 PM	3/30/05 4:31 PM	Chromium	Total	206	ug/L		205		0.49%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/30/05 4:37 PM	3/30/05 4:31 PM	Cobalt	Total	500	ug/L		498		0.40%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/30/05 4:37 PM	3/30/05 4:31 PM	Copper	Total	254	ug/L		252		0.79%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/31/05 12:51 AM	3/31/05 12:46 AM	Iron	Total	1110	ug/L		1120		0.90%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/30/05 4:37 PM	3/30/05 4:31 PM	Lead	Total	497	ug/L		497		0.00%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/31/05 12:51 AM	3/31/05 12:46 AM	Magnesium	Total	62800	ug/L		63200		0.63%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/30/05 4:37 PM	3/30/05 4:31 PM	Manganese	Total	502	ug/L		500		0.40%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/30/05 4:37 PM	3/30/05 4:31 PM	Nickel	Total	504	ug/L		501		0.60%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/31/05 12:51 AM	3/31/05 12:46 AM	Potassium	Total	51500	ug/L		52000		0.97%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/30/05 4:37 PM	3/30/05 4:31 PM	Selenium	Total	2060	ug/L		2060		0.00%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/30/05 4:37 PM	3/30/05 4:31 PM	Silver	Total	53.6	ug/L		53.2		0.75%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/31/05 12:51 AM	3/31/05 12:46 AM	Sodium	Total	225000	ug/L		224000		0.45%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/30/05 4:37 PM	3/30/05 4:31 PM	Vanadium	Total	519	ug/L		516		0.58%	pass
D5C280224001D	D5C280224001S	KP-SW-1-032805	KP-SW-1-032805	D5C280224	D5C280224	3/30/05 4:37 PM	3/30/05 4:31 PM	Zinc	Total	516	ug/L		512		0.78%	pass
D5C280224002D	D5C280224002S	KP-SW-2-032805	KP-SW-2-032805	D5C280224	D5C280224	3/30/05 10:28 PM	3/30/05 10:24 PM	Antimony	Total	42.1	ug/L		41.6		1.19%	pass
D5C280224002D	D5C280224002S	KP-SW-2-032805	KP-SW-2-032805	D5C280224	D5C280224	3/30/05 10:28 PM	3/30/05 10:24 PM	Arsenic	Total	42.4	ug/L		41.5		2.15%	pass
D5C280224002D	D5C280224002S	KP-SW-2-032805	KP-SW-2-032805	D5C280224	D5C280224	3/30/05 10:28 PM	3/30/05 10:24 PM	Beryllium	Total	41.1	ug/L		40.5		1.47%	pass
D5C280224002D	D5C280224002S	KP-SW-2-032805	KP-SW-2-032805	D5C280224	D5C280224	3/30/05 10:28 PM	3/30/05 10:24 PM	Cadmium	Total	46.7	ug/L		45.1		3.49%	pass

Table E-7. Data Quality Assessment
Evaluation of Laboratory Duplicate Samples

B. WATER

Lab ID		Sample ID		Lot ID		Analyzed		Anayte	Analyte Type	Result (ug/L)					RPD (%)	QC Acceptance Criteria
MSD	MS	MSD	MS	MSD	MS	MSD	MS			MSD			MS			
D5C280224002D	D5C280224002S	KP-SW-2-032805	KP-SW-2-032805	D5C280224	D5C280224	3/30/05 10:28 PM	3/30/05 10 24 PM	Thallium	Total	41.8	ug/L		40.8		2.42%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 10:20 PM	5/6/05 10:15 PM	Aluminum	Dissolved	2290	ug/L		2310		0.87%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/9/05 10 56 PM	5/9/05 10:52 PM	Antimony	Dissolved	42.4	ug/L		42.2		0.47%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/9/05 10.56 PM	5/9/05 10:52 PM	Arsenic	Dissolved	41.4	ug/L		40.8		1.46%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 1:11 PM	5/6/05 1.06 PM	Barium	Dissolved	2130	ug/L		2160		1.40%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/9/05 10:56 PM	5/9/05 10:52 PM	Beryllium	Dissolved	42.1	ug/L		42.1		0.00%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/9/05 10.56 PM	5/9/05 10:52 PM	Cadmium	Dissolved	39.7	ug/L		38.9		2.04%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 10.20 PM	5/6/05 10:15 PM	Calcium	Dissolved	114000	ug/L		115000		0.87%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 1:11 PM	5/6/05 1:06 PM	Chromium	Dissolved	200	ug/L		202		1.00%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 1:11 PM	5/6/05 1:06 PM	Cobalt	Dissolved	501	ug/L		506		0.99%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 1:11 PM	5/6/05 1:06 PM	Copper	Dissolved	254	ug/L		257		1.17%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 10 20 PM	5/6/05 10:15 PM	Iron	Dissolved	1160	ug/L		1170		0.86%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 1:11 PM	5/6/05 1:06 PM	Lead	Dissolved	500	ug/L		506		1.19%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 10:20 PM	5/6/05 10.15 PM	Magnesium	Dissolved	63000	ug/L		63700		1.10%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 1:11 PM	5/6/05 1:06 PM	Manganese	Dissolved	837	ug/L		844		0.83%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/9/05 5:47 PM	5/9/05 5:46 PM	Mercury	Dissolved	5.16	ug/L		5.16		0.00%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 1:11 PM	5/6/05 1:06 PM	Nickel	Dissolved	499	ug/L		504		1.00%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 10.20 PM	5/6/05 10:15 PM	Potassium	Dissolved	61100	ug/L		61600		0.81%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 1:11 PM	5/6/05 1:06 PM	Selenium	Dissolved	2050	ug/L		2090		1.93%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 1:11 PM	5/6/05 1:06 PM	Silver	Dissolved	54.5	ug/L		54.9		0.73%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 10:20 PM	5/6/05 10:15 PM	Sodium	Dissolved	375000	ug/L	NC MSB	376000	NC MSB	0.27%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/9/05 10.56 PM	5/9/05 10:52 PM	Thallium	Dissolved	40.6	ug/L		40.2		0.99%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 1:11 PM	5/6/05 1:06 PM	Vanadium	Dissolved	498	ug/L		504		1.20%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 1:11 PM	5/6/05 1:06 PM	Zinc	Dissolved	489	ug/L		493		0.81%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 8:11 PM	5/6/05 8:06 PM	Aluminum	Total	148000	ug/L	NC MSB	152000	NC MSB	2.67%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/10/05 12:01 AM	5/9/05 11:58 PM	Antimony	Total	8.3	ug/L	N	9.18	N	10.07%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/10/05 12:01 AM	5/9/05 11:58 PM	Arsenic	Total	60.4	ug/L	N	60.1	N	0.50%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 4:17 PM	5/6/05 4:12 PM	Barium	Total	3290	ug/L		3290		0.00%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/10/05 12:01 AM	5/9/05 11:58 PM	Beryllium	Total	33.9	ug/L	N	33.7	N	0.59%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/10/05 12:01 AM	5/9/05 11:58 PM	Cadmium	Total	39.3	ug/L		39.8		1.26%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 8:11 PM	5/6/05 8:06 PM	Calcium	Total	149000	ug/L		148000		0.67%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 4:17 PM	5/6/05 4:12 PM	Chromium	Total	363	ug/L		366		0.82%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 4:17 PM	5/6/05 4:12 PM	Cobalt	Total	517	ug/L		516		0.19%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 4:17 PM	5/6/05 4:12 PM	Copper	Total	340	ug/L		339		0.29%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 8:11 PM	5/6/05 8:06 PM	Iron	Total	179000	ug/L	NC MSB	177000	NC MSB	1.12%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 4:17 PM	5/6/05 4:12 PM	Lead	Total	568	ug/L		568		0.00%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 8:11 PM	5/6/05 8.06 PM	Magnesium	Total	84700	ug/L		84400		0.35%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 4:17 PM	5/6/05 4:12 PM	Manganese	Total	6110	ug/L	NC MSB	6100	NC MSB	0.16%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/9/05 6:16 PM	5/9/05 6:14 PM	Mercury	Total	5.22	ug/L		5.14		1.54%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 4:17 PM	5/6/05 4:12 PM	Nickel	Total	539	ug/L		541		0.37%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 8:11 PM	5/6/05 8:06 PM	Potassium	Total	69900	ug/L		69800		0.14%	pass

Table E-7. Data Quality Assessment
Evaluation of Laboratory Duplicate Samples

B. WATER

Lab ID		Sample ID		Lot ID		Analyzed		Anayte	Analyte Type	Result (ug/L)					RPD (%)	QC Acceptance Criteria
MSD	MS	MSD	MS	MSD	MS	MSD	MS			MSD			MS			
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 4:17 PM	5/6/05 4:12 PM	Selenium	Total	1890	ug/L		1890		0.00%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 4:17 PM	5/6/05 4:12 PM	Silver	Total	51.7	ug/L		52.3		1.15%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 8:11 PM	5/6/05 8:06 PM	Sodium	Total	345000	ug/L	NC MSB	342000	NC MSB	0.87%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/10/05 12:01 AM	5/9/05 11:58 PM	Thallium	Total	37.1	ug/L		37		0.27%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 4:17 PM	5/6/05 4:12 PM	Vanadium	Total	735	ug/L		743		1.08%	pass
D5E020222008D	D5E020222008S	PS-1-050205	PS-1-050205	D5E020222	D5E020222	5/6/05 8:11 PM	5/6/05 8:06 PM	Zinc	Total	883	ug/L		868		1.71%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/27/2005 17:47	9/27/2005 17:43	Aluminum	Dissolved	2400	ug/L		2320		3.39%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/26/2005 21:21	9/26/2005 21:16	Aluminum	Total	56700	ug/L	NC MSB	55100	NC MSB	2.86%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/29/2005 2:49	9/29/2005 2:45	Antimony	Dissolved	40.2	ug/L		40.7		1.24%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/27/2005 20:10	9/27/2005 20:06	Antimony	Total	18.2	ug/L	N	21.5	N	16.62%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/29/2005 2:49	9/29/2005 2:45	Arsenic	Dissolved	40.8	ug/L		40.5		0.74%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/27/2005 20:10	9/27/2005 20:06	Arsenic	Total	49.2	ug/L		47.8		2.89%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 3:20	9/28/2005 3:15	Barium	Dissolved	2320	ug/L		2230		3.96%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 8:28	9/28/2005 8:23	Barium	Total	2640	ug/L		2660		0.75%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/29/2005 2:49	9/29/2005 2:45	Beryllium	Dissolved	42.8	ug/L		43.2		0.93%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/27/2005 20:10	9/27/2005 20:06	Beryllium	Total	37.3	ug/L		35.6	N	4.66%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/29/2005 2:49	9/29/2005 2:45	Cadmium	Dissolved	40.6	ug/L		41		0.98%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/27/2005 20:10	9/27/2005 20:06	Cadmium	Total	53.1	ug/L		52.5		1.14%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/27/2005 17:47	9/27/2005 17:43	Calcium	Dissolved	168000	ug/L		161000		4.26%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/26/2005 21:21	9/26/2005 21:16	Calcium	Total	158000	ug/L		158000		0.00%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 3:20	9/28/2005 3:15	Chromium	Dissolved	201	ug/L		194		3.54%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 8:28	9/28/2005 8:23	Chromium	Total	256	ug/L		259		1.17%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 3:20	9/28/2005 3:15	Cobalt	Dissolved	513	ug/L		494		3.77%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 8:28	9/28/2005 8:23	Cobalt	Total	506	ug/L		511		0.98%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 3:20	9/28/2005 3:15	Copper	Dissolved	287	ug/L		268		6.85%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 8:28	9/28/2005 8:23	Copper	Total	327	ug/L		328		0.31%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/27/2005 17:47	9/27/2005 17:43	Iron	Dissolved	1310	ug/L		1240		5.49%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/26/2005 21:21	9/26/2005 21:16	Iron	Total	55500	ug/L	NC MSB	54700	NC MSB	1.45%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 3:20	9/28/2005 3:15	Lead	Dissolved	516	ug/L		497		3.75%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 8:28	9/28/2005 8:23	Lead	Total	530	ug/L		533		0.56%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/27/2005 17:47	9/27/2005 17:43	Magnesium	Dissolved	75800	ug/L		73300		3.35%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/26/2005 21:21	9/26/2005 21:16	Magnesium	Total	78500	ug/L		78700		0.25%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 3:20	9/28/2005 3:15	Manganese	Dissolved	3480	ug/L	NC MSB	3320	NC MSB	4.71%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 8:28	9/28/2005 8:23	Manganese	Total	7350	ug/L	NC MSB	7290	NC MSB	0.82%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/26/2005 18:07	9/26/2005 18:05	Mercury	Dissolved	4.96	ug/L		5.09		2.59%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/26/2005 17:33	9/26/2005 17:31	Mercury	Total	4.5	ug/L		4.48		0.45%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 3:20	9/28/2005 3:15	Nickel	Dissolved	510	ug/L		492		3.59%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 8:28	9/28/2005 8:23	Nickel	Total	514	ug/L		521		1.35%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/27/2005 17:47	9/27/2005 17:43	Potassium	Dissolved	83000	ug/L		80400		3.18%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/26/2005 21:21	9/26/2005 21:16	Potassium	Total	88100	ug/L		87800		0.34%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 3:20	9/28/2005 3:15	Selenium	Dissolved	2190	ug/L		2110		3.72%	pass

Table E-7. Data Quality Assessment
Evaluation of Laboratory Duplicate Samples

B. WATER

Lab ID		Sample ID		Lot ID		Analyzed		Anayte	Analyte Typo	Result (ug/L)		RPD (%)	QC Acceptance Critoria
MSD	MS	MSD	MS	MSD	MS	MSD	MS			MSD	MS		
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 8.28	9/28/2005 8:23	Selenium	Total	2010 ug/L	2030	0.99%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 3:20	9/28/2005 3:15	Silver	Dissolved	55.8 ug/L	53.8	3.65%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 8.28	9/28/2005 8:23	Silver	Total	51.6 ug/L	51.8	0.39%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/27/2005 17 47	9/27/2005 17:43	Sodium	Dissolved	242000 ug/L	234000	3.36%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/26/2005 21.21	9/26/2005 21:16	Sodium	Total	226000 ug/L	222000	1.79%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/29/2005 2.49	9/29/2005 2:45	Thallium	Dissolved	42.6 ug/L	42.5	0.24%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/27/2005 20.10	9/27/2005 20:06	Thallium	Total	41.2 ug/L	41.1	0.24%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 3:20	9/28/2005 3:15	Vanadium	Dissolved	513 ug/L	495	3.57%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 8.28	9/28/2005 8:23	Vanadium	Total	579 ug/L	582	0.52%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 3:20	9/28/2005 3:15	Zinc	Dissolved	508 ug/L	486	4.43%	pass
D5I190220002D	D5I190220002S	KP-PS-18-091905	KP-PS-18-091905	D5I190220	D5I190220	9/28/2005 8.28	9/28/2005 8:23	Zinc	Total	933 ug/L	931	0.21%	pass

Fail = Relative Percent Difference (RPD) does not meet QC acceptance criteria (RPD>20%).
* RPD is outside percent control limits.
N = Spiked recovery outside QC control limits.
NC MSB = Not calculated. Parent sample concentrations greater than four times the spiked amounts.
NA = QC acceptance criteria not evaluated. Percent recovery not available for analyte.
Pass = Relative Percent Difference (RPD) is within QC acceptance criteria (RPD<20%).
QC = Quality Control

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

A. SOIL

Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (mg/kg)	QC Acceptance Criteria Evaluation
D3L110000319B	D3L100414	12/18/2003 15:22	Mercury	Total	ND	pass
D3L110000321B	D3L100414	12/18/2003 16:13	Mercury	Total	ND	pass
D3L110000608B	D3L100414	12/29/2003 19:01	Aluminum	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Antimony	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Arsenic	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Barium	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Beryllium	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Cadmium	Total	ND	pass
D3L110000608B	D3L100414	12/29/2003 19:01	Calcium	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Chromium	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Cobalt	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Copper	Total	ND	pass
D3L110000608B	D3L100414	12/29/2003 19:01	Iron	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Lead	Total	ND	pass
D3L110000608B	D3L100414	12/29/2003 19:01	Magnesium	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Manganese	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Nickel	Total	ND	pass
D3L110000608B	D3L100414	12/29/2003 19:01	Potassium	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Selenium	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Silver	Total	ND	pass
D3L110000608B	D3L100414	12/29/2003 19:01	Sodium	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Thallium	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Vanadium	Total	ND	pass
D3L110000608B	D3L100414	12/19/2003 11:14	Zinc	Total	ND	pass
D3L120000434B	D3L110408	12/17/2003 17:30	Mercury	Total	ND	pass
D3L120000435B	D3L110408	12/18/2003 16:38	Mercury	Total	ND	pass
D3L130000135B	D3L110408	12/28/2003 19:19	Aluminum	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Antimony	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Arsenic	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Barium	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Beryllium	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Cadmium	Total	ND	pass
D3L130000135B	D3L110408	12/28/2003 19:19	Calcium	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Chromium	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Cobalt	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Copper	Total	ND	pass
D3L130000135B	D3L110408	12/28/2003 19:19	Iron	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Lead	Total	ND	pass
D3L130000135B	D3L110408	12/28/2003 19:19	Magnesium	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Manganese	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Nickel	Total	ND	pass
D3L130000135B	D3L110408	12/28/2003 19:19	Potassium	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Selenium	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Silver	Total	ND	pass

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

A. SOIL

Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (mg/kg)	QC Acceptance Criteria Evaluation
D3L130000135B	D3L110408	12/28/2003 19:19	Sodium	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Thallium	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Vanadium	Total	ND	pass
D3L130000135B	D3L110408	12/19/2003 17:20	Zinc	Total	ND	pass
D3L190000594B	D3L190390	12/30/2003 0:01	Aluminum	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Antimony	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Arsenic	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Barium	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Beryllium	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Cadmium	Total	ND	pass
D3L190000594B	D3L190390	12/30/2003 0:01	Calcium	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Chromium	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Cobalt	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Copper	Total	ND	pass
D3L190000594B	D3L190390	12/30/2003 0:01	Iron	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Lead	Total	ND	pass
D3L190000594B	D3L190390	12/30/2003 0:01	Magnesium	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Manganese	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Nickel	Total	ND	pass
D3L190000594B	D3L190390	12/30/2003 0:01	Potassium	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Selenium	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Silver	Total	ND	pass
D3L190000594B	D3L190390	12/30/2003 0:01	Sodium	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Thallium	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Vanadium	Total	ND	pass
D3L190000594B	D3L190390	12/22/2003 23:39	Zinc	Total	ND	pass
D3L190000678B	D3L190405	12/30/2003 3:03	Aluminum	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Antimony	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Arsenic	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Barium	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Beryllium	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Cadmium	Total	ND	pass
D3L190000678B	D3L190405	12/30/2003 3:03	Calcium	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Chromium	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Cobalt	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Copper	Total	ND	pass
D3L190000678B	D3L190405	12/30/2003 3:03	Iron	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Lead	Total	ND	pass
D3L190000678B	D3L190405	12/30/2003 3:03	Magnesium	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Manganese	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Nickel	Total	ND	pass
D3L190000678B	D3L190405	12/30/2003 3:03	Potassium	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Selenium	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Silver	Total	ND	pass

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

A. SOIL

Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (mg/kg)	QC Acceptance Criteria Evaluation
D3L190000678B	D3L190405	12/30/2003 3:03	Sodium	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Thallium	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Vanadium	Total	ND	pass
D3L190000678B	D3L190405	12/23/2003 19:09	Zinc	Total	ND	pass
D3L220000296B	D3L190390	12/23/2003 14:38	Mercury	Total	ND	pass
D3L220000299B	D3L190390	12/27/2003 21:19	Mercury	Total	ND	pass
D3L220000299B	D3L190405	12/27/2003 21:19	Mercury	Total	ND	pass
D3L220000300B	D3L190405	12/23/2003 16:18	Mercury	Total	ND	pass
D3L220000301B	D3L190419	12/31/2003 12:13	Mercury	Total	ND	pass
D3L220000302B	D3L190461	12/31/2003 13:40	Mercury	Total	ND	pass
D3L220000303B	D3L190464	12/31/2003 14:20	Mercury	Total	ND	pass
D3L230000647B	D3L190464	1/5/2004 4:04	Aluminum	Total	ND	pass
D3L230000647B	D3L190464	1/4/2004 2:08	Antimony	Total	ND	pass
D3L230000647B	D3L190464	1/4/2004 2:08	Arsenic	Total	ND	pass
D3L230000647B	D3L190464	1/4/2004 2:08	Barium	Total	ND	pass
D3L230000647B	D3L190464	1/4/2004 2:08	Beryllium	Total	ND	pass
D3L230000647B	D3L190464	1/4/2004 2:08	Cadmium	Total	ND	pass
D3L230000647B	D3L190464	1/5/2004 4:04	Calcium	Total	ND	pass
D3L230000647B	D3L190464	1/4/2004 2:08	Chromium	Total	ND	pass
D3L230000647B	D3L190464	1/4/2004 2:08	Cobalt	Total	ND	pass
D3L230000647B	D3L190464	1/4/2004 2:08	Copper	Total	ND	pass
D3L230000647B	D3L190464	1/5/2004 4:04	Iron	Total	ND	pass
D3L230000647B	D3L190464	1/4/2004 2:08	Lead	Total	ND	pass
D3L230000647B	D3L190464	1/5/2004 4:04	Magnesium	Total	ND	pass
D3L230000647B	D3L190464	1/5/2004 4:04	Manganese	Total	ND	pass
D3L230000647B	D3L190464	1/4/2004 2:08	Nickel	Total	ND	pass
D3L230000647B	D3L190464	1/5/2004 4:04	Potassium	Total	ND	pass
D3L230000647B	D3L190464	1/4/2004 2:08	Selenium	Total	ND	pass
D3L230000647B	D3L190464	1/4/2004 2:08	Silver	Total	ND	pass
D3L230000647B	D3L190464	1/5/2004 4:04	Sodium	Total	ND	pass
D3L230000647B	D3L190464	1/4/2004 2:08	Thallium	Total	ND	pass
D3L230000647B	D3L190464	1/4/2004 2:08	Vanadium	Total	ND	pass
D3L230000647B	D3L190464	1/5/2004 4:04	Zinc	Total	ND	pass
D3L230000648B	D3L190419	1/5/2004 0.58	Aluminum	Total	ND	pass
D3L230000648B	D3L190419	12/30/2003 18:05	Antimony	Total	ND	pass
D3L230000648B	D3L190419	12/30/2003 18:05	Arsenic	Total	ND	pass
D3L230000648B	D3L190419	12/30/2003 18:05	Barium	Total	ND	pass
D3L230000648B	D3L190419	12/30/2003 18:05	Beryllium	Total	ND	pass
D3L230000648B	D3L190419	12/30/2003 18:05	Cadmium	Total	ND	pass
D3L230000648B	D3L190419	1/5/2004 0:58	Calcium	Total	ND	pass
D3L230000648B	D3L190419	12/30/2003 18:05	Chromium	Total	ND	pass
D3L230000648B	D3L190419	12/30/2003 18:05	Cobalt	Total	ND	pass
D3L230000648B	D3L190419	12/30/2003 18:05	Copper	Total	ND	pass
D3L230000648B	D3L190419	1/5/2004 0:58	Iron	Total	ND	pass

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

A. SOIL

Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (mg/kg)	QC Acceptance Criteria Evaluation
D3L230000648B	D3L190419	12/30/2003 18:05	Lead	Total	ND	pass
D3L230000648B	D3L190419	1/5/2004 0:58	Magnesium	Total	ND	pass
D3L230000648B	D3L190419	12/30/2003 18:05	Manganese	Total	ND	pass
D3L230000648B	D3L190419	12/30/2003 18:05	Nickel	Total	ND	pass
D3L230000648B	D3L190419	1/5/2004 0:58	Potassium	Total	ND	pass
D3L230000648B	D3L190419	12/30/2003 18:05	Selenium	Total	ND	pass
D3L230000648B	D3L190419	12/30/2003 18:05	Silver	Total	ND	pass
D3L230000648B	D3L190419	1/5/2004 0:58	Sodium	Total	ND	pass
D3L230000648B	D3L190419	12/30/2003 18:05	Thallium	Total	ND	pass
D3L230000648B	D3L190419	12/30/2003 18:05	Vanadium	Total	ND	pass
D3L230000648B	D3L190419	1/5/2004 0:58	Zinc	Total	ND	pass
D3L230000649B	D3L190461	1/5/2004 6:22	Aluminum	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Antimony	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Arsenic	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Barium	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Beryllium	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Cadmium	Total	ND	pass
D3L230000649B	D3L190461	1/5/2004 6:22	Calcium	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Chromium	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Cobalt	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Copper	Total	ND	pass
D3L230000649B	D3L190461	1/5/2004 6:22	Iron	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Lead	Total	ND	pass
D3L230000649B	D3L190461	1/5/2004 6:22	Magnesium	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Manganese	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Nickel	Total	ND	pass
D3L230000649B	D3L190461	1/5/2004 6:22	Potassium	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Selenium	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Silver	Total	ND	pass
D3L230000649B	D3L190461	1/5/2004 6:22	Sodium	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Thallium	Total	ND	pass
D3L230000649B	D3L190461	12/31/2003 21:15	Vanadium	Total	ND	pass
D3L230000649B	D3L190461	1/5/2004 6:22	Zinc	Total	ND	pass

Fail = Does not meet QC acceptance criteria (chemical detected above detection limit).

ND = Concentration not detected at concentrations above the reporting limit.

Pass = Results are within QC acceptance criteria (below detection limit).

QC = Quality Control

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

B. GROUNDWATER

Lab Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (ug/L)	QC Acceptance Criteria Evaluation
D3L110000334B	D3L100414	12/15/2003 18:42	Mercury	Total	ND	pass
D3L120000442B	D3L110408	12/15/2003 17:18	Mercury	Total	ND	pass
D3L130000128B	D3L110408	12/19/2003 2:53	Antimony	Total	ND	pass
D3L130000128B	D3L110408	12/19/2003 2:53	Arsenic	Total	ND	pass
D3L130000128B	D3L110408	12/19/2003 2:53	Beryllium	Total	ND	pass
D3L130000128B	D3L110408	12/19/2003 2:53	Cadmium	Total	ND	pass
D3L130000128B	D3L110408	12/19/2003 2:53	Thallium	Total	ND	pass
D3L130000167B	D3L110408	12/22/2003 14:36	Aluminum	Total	ND	pass
D3L130000167B	D3L110408	12/16/2003 11:06	Barium	Total	ND	pass
D3L130000167B	D3L110408	12/22/2003 14:36	Calcium	Total	ND	pass
D3L130000167B	D3L110408	12/16/2003 11:06	Chromium	Total	ND	pass
D3L130000167B	D3L110408	12/16/2003 11:06	Cobalt	Total	ND	pass
D3L130000167B	D3L110408	12/16/2003 11:06	Copper	Total	ND	pass
D3L130000167B	D3L110408	12/22/2003 14:36	Iron	Total	ND	pass
D3L130000167B	D3L110408	12/16/2003 11:06	Lead	Total	ND	pass
D3L130000167B	D3L110408	12/22/2003 14:36	Magnesium	Total	ND	pass
D3L130000167B	D3L110408	12/16/2003 11:06	Manganese	Total	ND	pass
D3L130000167B	D3L110408	12/16/2003 11:06	Nickel	Total	ND	pass
D3L130000167B	D3L110408	12/22/2003 14:36	Potassium	Total	ND	pass
D3L130000167B	D3L110408	12/16/2003 11:06	Selenium	Total	ND	pass
D3L130000167B	D3L110408	12/16/2003 11:06	Silver	Total	ND	pass
D3L130000167B	D3L110408	12/22/2003 14:36	Sodium	Total	ND	pass
D3L130000167B	D3L110408	12/16/2003 11:06	Vanadium	Total	ND	pass
D3L130000167B	D3L110408	12/16/2003 11:06	Zinc	Total	ND	pass
D3L160000478B	D3L100414	12/29/2003 9:15	Aluminum	Total	ND	pass
D3L160000478B	D3L100414	12/19/2003 13:35	Barium	Total	ND	pass
D3L160000478B	D3L100414	12/29/2003 9:15	Calcium	Total	ND	pass
D3L160000478B	D3L100414	12/19/2003 13:35	Chromium	Total	ND	pass
D3L160000478B	D3L100414	12/19/2003 13:35	Cobalt	Total	ND	pass
D3L160000478B	D3L100414	12/19/2003 13:35	Copper	Total	ND	pass
D3L160000478B	D3L100414	12/29/2003 9:15	Iron	Total	ND	pass
D3L160000478B	D3L100414	12/19/2003 13:35	Lead	Total	ND	pass
D3L160000478B	D3L100414	12/29/2003 9:15	Magnesium	Total	ND	pass
D3L160000478B	D3L100414	12/19/2003 13:35	Manganese	Total	ND	pass
D3L160000478B	D3L100414	12/19/2003 13:35	Nickel	Total	ND	pass
D3L160000478B	D3L100414	12/29/2003 9:15	Potassium	Total	ND	pass
D3L160000478B	D3L100414	12/19/2003 13:35	Selenium	Total	ND	pass
D3L160000478B	D3L100414	12/19/2003 13:35	Silver	Total	ND	pass
D3L160000478B	D3L100414	12/29/2003 9:15	Sodium	Total	ND	pass
D3L160000478B	D3L100414	12/19/2003 13:35	Vanadium	Total	ND	pass
D3L160000478B	D3L100414	12/19/2003 13:35	Zinc	Total	ND	pass
D3L170000625B	D3L100414	12/24/2003 7:17	Antimony	Total	ND	pass
D3L170000625B	D3L100414	12/24/2003 7:17	Arsenic	Total	ND	pass
D3L170000625B	D3L100414	12/24/2003 7:17	Beryllium	Total	ND	pass

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

B. GROUNDWATER

Lab Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (ug/L)	QC Acceptance Criteria Evaluation
D3L170000625B	D3L100414	12/24/2003 7:17	Cadmium	Total	ND	pass
D3L170000625B	D3L100414	12/24/2003 7:17	Thallium	Total	ND	pass
D3L210000117B	D3L190390	12/24/2003 6:15	Antimony	Total	ND	pass
D3L210000117B	D3L190390	12/24/2003 6:15	Arsenic	Total	ND	pass
D3L210000117B	D3L190390	12/24/2003 6:15	Beryllium	Total	ND	pass
D3L210000117B	D3L190390	12/24/2003 6:15	Cadmium	Total	ND	pass
D3L210000117B	D3L190390	12/24/2003 6:15	Thallium	Total	ND	pass
D3L210000118B	D3L190390	12/29/2003 7:26	Aluminum	Total	ND	pass
D3L210000118B	D3L190390	12/23/2003 17:10	Barium	Total	ND	pass
D3L210000118B	D3L190390	12/29/2003 7:26	Calcium	Total	ND	pass
D3L210000118B	D3L190390	12/23/2003 17:10	Chromium	Total	ND	pass
D3L210000118B	D3L190390	12/23/2003 17:10	Cobalt	Total	ND	pass
D3L210000118B	D3L190390	12/23/2003 17:10	Copper	Total	ND	pass
D3L210000118B	D3L190390	12/29/2003 7:26	Iron	Total	ND	pass
D3L210000118B	D3L190390	12/23/2003 17:10	Lead	Total	ND	pass
D3L210000118B	D3L190390	12/29/2003 7:26	Magnesium	Total	ND	pass
D3L210000118B	D3L190390	12/23/2003 17:10	Manganese	Total	ND	pass
D3L210000118B	D3L190390	12/23/2003 17:10	Nickel	Total	ND	pass
D3L210000118B	D3L190390	12/29/2003 7:26	Potassium	Total	ND	pass
D3L210000118B	D3L190390	12/23/2003 17:10	Selenium	Total	ND	pass
D3L210000118B	D3L190390	12/23/2003 17:10	Silver	Total	ND	pass
D3L210000118B	D3L190390	12/29/2003 7:26	Sodium	Total	ND	pass
D3L210000118B	D3L190390	12/23/2003 17:10	Vanadium	Total	ND	pass
D3L210000118B	D3L190390	12/23/2003 17:10	Zinc	Total	ND	pass
D3L220000305B	D3L190390	12/22/2003 18:55	Mercury	Total	ND	pass
D3L220000306B	D3L190419	12/30/2003 17:31	Mercury	Total	ND	pass
D3L220000307B	D3L190461	12/30/2003 18:46	Mercury	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 18:12	Aluminum	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 14:48	Barium	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 18:12	Calcium	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 14:48	Chromium	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 14:48	Cobalt	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 14:48	Copper	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 18:12	Iron	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 14:48	Lead	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 18:12	Magnesium	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 14:48	Manganese	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 14:48	Nickel	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 18:12	Potassium	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 14:48	Selenium	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 14:48	Silver	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 18:12	Sodium	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 14:48	Vanadium	Total	ND	pass
D3L300000671B	D3L190419	1/7/2004 14:48	Zinc	Total	ND	pass

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

B. GROUNDWATER

Lab Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (ug/L)	QC Acceptance Criteria Evaluation
D3L300000671B	D3L190461	1/7/2004 18:12	Aluminum	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 14.48	Barium	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 18:12	Calcium	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 14:48	Chromium	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 14:48	Cobalt	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 14:48	Copper	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 18:12	Iron	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 14:48	Lead	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 18:12	Magnesium	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 14:48	Manganese	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 14:48	Nickel	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 18:12	Potassium	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 14:48	Selenium	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 14:48	Silver	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 18:12	Sodium	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 14:48	Vanadium	Total	ND	pass
D3L300000671B	D3L190461	1/7/2004 14:48	Zinc	Total	ND	pass
D3L300000672B	D3L190419	1/7/2004 17:54	Antimony	Total	ND	pass
D3L300000672B	D3L190419	1/7/2004 17:54	Arsenic	Total	ND	pass
D3L300000672B	D3L190419	1/7/2004 17:54	Beryllium	Total	ND	pass
D3L300000672B	D3L190419	1/7/2004 17:54	Cadmium	Total	ND	pass
D3L300000672B	D3L190419	1/7/2004 17:54	Thallium	Total	ND	pass
D3L300000672B	D3L190461	1/7/2004 17:54	Antimony	Total	ND	pass
D3L300000672B	D3L190461	1/7/2004 17:54	Arsenic	Total	ND	pass
D3L300000672B	D3L190461	1/7/2004 17:54	Beryllium	Total	ND	pass
D3L300000672B	D3L190461	1/7/2004 17:54	Cadmium	Total	ND	pass
D3L300000672B	D3L190461	1/7/2004 17:54	Thallium	Total	ND	pass
	D4E040112	5/10/2004 3:18:00 PM	Mercury	Total	ND	pass
	D4E040112	5/13/2004 10:49:00 AM	Mercury	Dissolved	ND	pass
	D4E040112	5/14/2004 10:07:00 PM	Barium	Total	ND	pass
	D4E040112	5/14/2004 10:07:00 PM	Chromium	Total	ND	pass
	D4E040112	5/14/2004 10:07:00 PM	Cobalt	Total	ND	pass
	D4E040112	5/14/2004 10:07:00 PM	Copper	Total	ND	pass
	D4E040112	5/14/2004 10:07:00 PM	Lead	Total	ND	pass
	D4E040112	5/14/2004 10:07:00 PM	Manganese	Total	ND	pass
	D4E040112	5/14/2004 10:07:00 PM	Nickel	Total	ND	pass
	D4E040112	5/14/2004 10:07:00 PM	Selenium	Total	ND	pass
	D4E040112	5/14/2004 10:07:00 PM	Silver	Total	ND	pass
	D4E040112	5/14/2004 10:07:00 PM	Vanadium	Total	ND	pass
	D4E040112	5/14/2004 10:07:00 PM	Zinc	Total	ND	pass
	D4E040112	5/15/2004 2:45:00 AM	Barium	Dissolved	ND	pass
	D4E040112	5/15/2004 2:45:00 AM	Chromium	Dissolved	ND	pass
	D4E040112	5/15/2004 2:45:00 AM	Cobalt	Dissolved	ND	pass
	D4E040112	5/15/2004 2:45:00 AM	Copper	Dissolved	ND	pass

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

B. GROUNDWATER

Lab Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (ug/L)	QC Acceptance Criteria Evaluation
	D4E040112	5/15/2004 2:45:00 AM	Lead	Dissolved	ND	pass
	D4E040112	5/15/2004 2:45:00 AM	Manganese	Dissolved	ND	pass
	D4E040112	5/15/2004 2:45:00 AM	Nickel	Dissolved	ND	pass
	D4E040112	5/15/2004 2:45:00 AM	Selenium	Dissolved	ND	pass
	D4E040112	5/15/2004 2:45:00 AM	Silver	Dissolved	ND	pass
	D4E040112	5/15/2004 2:45:00 AM	Vanadium	Dissolved	ND	pass
	D4E040112	5/15/2004 2:45:00 AM	Zinc	Dissolved	ND	pass
	D4E040112	5/15/2004 8:27:00 AM	Aluminum	Total	ND	pass
	D4E040112	5/15/2004 8:27:00 AM	Calcium	Total	ND	pass
	D4E040112	5/15/2004 8:27:00 AM	Iron	Total	ND	pass
	D4E040112	5/15/2004 8:27:00 AM	Magnesium	Total	ND	pass
	D4E040112	5/15/2004 8:27:00 AM	Potassium	Total	ND	pass
	D4E040112	5/15/2004 8:27:00 AM	Sodium	Total	ND	pass
	D4E040112	5/17/2004 12:13:00 AM	Aluminum	Dissolved	ND	pass
	D4E040112	5/17/2004 12:13:00 AM	Calcium	Dissolved	ND	pass
	D4E040112	5/17/2004 12:13:00 AM	Iron	Dissolved	ND	pass
	D4E040112	5/17/2004 12:13:00 AM	Magnesium	Dissolved	ND	pass
	D4E040112	5/17/2004 12:13:00 AM	Potassium	Dissolved	ND	pass
	D4E040112	5/17/2004 12:13:00 AM	Sodium	Dissolved	ND	pass
	D4E040112	5/17/2004 8:23:00 PM	Antimony	Dissolved	ND	pass
	D4E040112	5/17/2004 8:23:00 PM	Arsenic	Dissolved	ND	pass
	D4E040112	5/17/2004 8:23:00 PM	Beryllium	Dissolved	ND	pass
	D4E040112	5/17/2004 8:23:00 PM	Cadmium	Dissolved	ND	pass
	D4E040112	5/17/2004 8:23:00 PM	Thallium	Dissolved	ND	pass
	D4E040112	5/18/2004 8:06:00 PM	Antimony	Total	ND	pass
	D4E040112	5/18/2004 8:06:00 PM	Arsenic	Total	ND	pass
	D4E040112	5/18/2004 8:06:00 PM	Beryllium	Total	ND	pass
	D4E040112	5/18/2004 8:06:00 PM	Cadmium	Total	ND	pass
	D4E040112	5/18/2004 8:06:00 PM	Thallium	Total	ND	pass
	D4E260121	6/1/2004 7:38:00 PM	Barium	Total	ND	pass
	D4E260121	6/1/2004 7:38:00 PM	Chromium	Total	ND	pass
	D4E260121	6/1/2004 7:38:00 PM	Cobalt	Total	ND	pass
	D4E260121	6/1/2004 7:38:00 PM	Copper	Total	ND	pass
	D4E260121	6/1/2004 7:38:00 PM	Lead	Total	ND	pass
	D4E260121	6/1/2004 7:38:00 PM	Manganese	Total	ND	pass
	D4E260121	6/1/2004 7:38:00 PM	Nickel	Total	ND	pass
	D4E260121	6/1/2004 7:38:00 PM	Selenium	Total	ND	pass
	D4E260121	6/1/2004 7:38:00 PM	Silver	Total	ND	pass
	D4E260121	6/1/2004 7:38:00 PM	Vanadium	Total	ND	pass
	D4E260121	6/1/2004 7:38:00 PM	Zinc	Total	ND	pass
	D4E260121	6/1/2004 8:25:00 PM	Barium	Dissolved	ND	pass
	D4E260121	6/1/2004 8:25:00 PM	Chromium	Dissolved	ND	pass
	D4E260121	6/1/2004 8:25:00 PM	Cobalt	Dissolved	ND	pass
	D4E260121	6/1/2004 8:25:00 PM	Copper	Dissolved	ND	pass

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

B. GROUNDWATER

Lab Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (ug/L)	QC Acceptance Criteria Evaluation
	D4E260121	6/1/2004 8:25:00 PM	Lead	Dissolved	ND	pass
	D4E260121	6/1/2004 8:25:00 PM	Manganese	Dissolved	ND	pass
	D4E260121	6/1/2004 8:25:00 PM	Nickel	Dissolved	ND	pass
	D4E260121	6/1/2004 8:25:00 PM	Selenium	Dissolved	ND	pass
	D4E260121	6/1/2004 8:25:00 PM	Silver	Dissolved	ND	pass
	D4E260121	6/1/2004 8:25:00 PM	Vanadium	Dissolved	ND	pass
	D4E260121	6/1/2004 8:25:00 PM	Zinc	Dissolved	ND	pass
	D4E260121	6/19/2004 12:58:00 PM	Antimony	Total	ND	pass
	D4E260121	6/19/2004 12:58:00 PM	Arsenic	Total	ND	pass
	D4E260121	6/19/2004 12:58:00 PM	Beryllium	Total	ND	pass
	D4E260121	6/19/2004 12:58:00 PM	Cadmium	Total	ND	pass
	D4E260121	6/19/2004 12:58:00 PM	Thallium	Total	ND	pass
	D4E260121	6/19/2004 8:04:00 PM	Antimony	Dissolved	ND	pass
	D4E260121	6/19/2004 8:04:00 PM	Arsenic	Dissolved	ND	pass
	D4E260121	6/19/2004 8:04:00 PM	Beryllium	Dissolved	ND	pass
	D4E260121	6/19/2004 8:04:00 PM	Cadmium	Dissolved	ND	pass
	D4E260121	6/19/2004 8:04:00 PM	Thallium	Dissolved	ND	pass
	D4E260121	6/4/2004 1:27:00 AM	Aluminum	Total	ND	pass
	D4E260121	6/4/2004 1:27:00 AM	Calcium	Total	ND	pass
	D4E260121	6/4/2004 1:27:00 AM	Iron	Total	ND	pass
	D4E260121	6/4/2004 1:27:00 AM	Magnesium	Total	ND	pass
	D4E260121	6/4/2004 1:27:00 AM	Potassium	Total	ND	pass
	D4E260121	6/4/2004 1:27:00 AM	Sodium	Total	ND	pass
	D4E260121	6/4/2004 2:13:00 AM	Aluminum	Dissolved	ND	pass
	D4E260121	6/4/2004 2:13:00 AM	Calcium	Dissolved	ND	pass
	D4E260121	6/4/2004 2:13:00 AM	Iron	Dissolved	ND	pass
	D4E260121	6/4/2004 2:13:00 AM	Magnesium	Dissolved	ND	pass
	D4E260121	6/4/2004 2:13:00 AM	Potassium	Dissolved	ND	pass
	D4E260121	6/4/2004 2:13:00 AM	Sodium	Dissolved	ND	pass
	D4E260121	6/6/2004 12:35:00 PM	Mercury	Dissolved	ND	pass
	D4E260121	6/6/2004 2:03:00 PM	Mercury	Total	ND	pass
	D4G010356	7/12/2004 7:41:00 PM	Antimony	Dissolved	ND	pass
	D4G010356	7/12/2004 7:41:00 PM	Arsenic	Dissolved	ND	pass
	D4G010356	7/12/2004 7:41:00 PM	Beryllium	Dissolved	ND	pass
	D4G010356	7/12/2004 7:41:00 PM	Cadmium	Dissolved	ND	pass
	D4G010356	7/12/2004 7:41:00 PM	Thallium	Dissolved	ND	pass
	D4G010356	7/12/2004 8:26:00 PM	Antimony	Total	ND	pass
	D4G010356	7/12/2004 8:26:00 PM	Arsenic	Total	ND	pass
	D4G010356	7/12/2004 8:26:00 PM	Beryllium	Total	ND	pass
	D4G010356	7/12/2004 8:26:00 PM	Cadmium	Total	ND	pass
	D4G010356	7/12/2004 8:26:00 PM	Thallium	Total	ND	pass
	D4G010356	7/13/2004 2:40:00 AM	Barium	Total	ND	pass
	D4G010356	7/13/2004 2:40:00 AM	Chromium	Total	ND	pass
	D4G010356	7/13/2004 2:40:00 AM	Cobalt	Total	ND	pass

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

B. GROUNDWATER

Lab Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (ug/L)	QC Acceptance Criteria Evaluation
	D4G010356	7/13/2004 2:40:00 AM	Copper	Total	ND	pass
	D4G010356	7/13/2004 2:40:00 AM	Lead	Total	ND	pass
	D4G010356	7/13/2004 2:40:00 AM	Manganese	Total	ND	pass
	D4G010356	7/13/2004 2:40:00 AM	Nickel	Total	ND	pass
	D4G010356	7/13/2004 2:40:00 AM	Selenium	Total	ND	pass
	D4G010356	7/13/2004 2:40:00 AM	Silver	Total	ND	pass
	D4G010356	7/13/2004 2:40:00 AM	Vanadium	Total	ND	pass
	D4G010356	7/13/2004 3:41:00 AM	Barium	Dissolved	ND	pass
	D4G010356	7/13/2004 3:41:00 AM	Chromium	Dissolved	ND	pass
	D4G010356	7/13/2004 3:41:00 AM	Cobalt	Dissolved	ND	pass
	D4G010356	7/13/2004 3:41:00 AM	Copper	Dissolved	ND	pass
	D4G010356	7/13/2004 3:41:00 AM	Lead	Dissolved	ND	pass
	D4G010356	7/13/2004 3:41:00 AM	Manganese	Dissolved	ND	pass
	D4G010356	7/13/2004 3:41:00 AM	Nickel	Dissolved	ND	pass
	D4G010356	7/13/2004 3:41:00 AM	Selenium	Dissolved	ND	pass
	D4G010356	7/13/2004 3:41:00 AM	Silver	Dissolved	ND	pass
	D4G010356	7/13/2004 3:41:00 AM	Vanadium	Dissolved	ND	pass
	D4G010356	7/14/2004 10:32:00 PM	Mercury	Total	ND	pass
	D4G010356	7/14/2004 11:13:00 PM	Mercury	Dissolved	ND	pass
	D4G010356	7/22/2004 1:47:00 AM	Aluminum	Total	ND	pass
	D4G010356	7/22/2004 1:47:00 AM	Calcium	Total	ND	pass
	D4G010356	7/22/2004 1:47:00 AM	Iron	Total	ND	pass
	D4G010356	7/22/2004 1:47:00 AM	Magnesium	Total	ND	pass
	D4G010356	7/22/2004 1:47:00 AM	Potassium	Total	ND	pass
	D4G010356	7/22/2004 1:47:00 AM	Sodium	Total	ND	pass
	D4G010356	7/22/2004 1:47:00 AM	Zinc	Total	ND	pass
	D4G010356	7/22/2004 2:44:00 AM	Aluminum	Dissolved	ND	pass
	D4G010356	7/22/2004 2:44:00 AM	Calcium	Dissolved	ND	pass
	D4G010356	7/22/2004 2:44:00 AM	Iron	Dissolved	ND	pass
	D4G010356	7/22/2004 2:44:00 AM	Magnesium	Dissolved	ND	pass
	D4G010356	7/22/2004 2:44:00 AM	Potassium	Dissolved	ND	pass
	D4G010356	7/22/2004 2:44:00 AM	Sodium	Dissolved	ND	pass
	D4G010356	7/22/2004 2:44:00 AM	Zinc	Dissolved	ND	pass
	D4G280388	8/12/2004 12:39:00 PM	Mercury	Dissolved	ND	pass
	D4G280388	8/12/2004 9:56:00 PM	Antimony	Dissolved	ND	pass
	D4G280388	8/12/2004 9:56:00 PM	Arsenic	Dissolved	ND	pass
	D4G280388	8/12/2004 9:56:00 PM	Beryllium	Dissolved	ND	pass
	D4G280388	8/12/2004 9:56:00 PM	Cadmium	Dissolved	ND	pass
	D4G280388	8/12/2004 9:56:00 PM	Thallium	Dissolved	ND	pass
	D4G280388	8/13/2004 3:08:00 PM	Mercury	Total	ND	pass
	D4G280388	8/4/2004 9:48:00 AM	Barium	Total	ND	pass
	D4G280388	8/4/2004 9:48:00 AM	Chromium	Total	ND	pass
	D4G280388	8/4/2004 9:48:00 AM	Cobalt	Total	ND	pass
	D4G280388	8/4/2004 9:48:00 AM	Copper	Total	ND	pass

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

B. GROUNDWATER

Lab Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (ug/L)	QC Acceptance Criteria Evaluation
	D4G280388	8/4/2004 9:48:00 AM	Lead	Total	ND	pass
	D4G280388	8/4/2004 9:48:00 AM	Manganese	Total	ND	pass
	D4G280388	8/4/2004 9:48:00 AM	Nickel	Total	ND	pass
	D4G280388	8/4/2004 9:48:00 AM	Selenium	Total	ND	pass
	D4G280388	8/4/2004 9:48:00 AM	Silver	Total	ND	pass
	D4G280388	8/4/2004 9:48:00 AM	Vanadium	Total	ND	pass
	D4G280388	8/6/2004 3:17:00 AM	Aluminum	Total	ND	pass
	D4G280388	8/6/2004 3:17:00 AM	Calcium	Total	ND	pass
	D4G280388	8/6/2004 3:17:00 AM	Iron	Total	ND	pass
	D4G280388	8/6/2004 3:17:00 AM	Magnesium	Total	ND	pass
	D4G280388	8/6/2004 3:17:00 AM	Potassium	Total	ND	pass
	D4G280388	8/6/2004 3:17:00 AM	Sodium	Total	ND	pass
	D4G280388	8/6/2004 3:17:00 AM	Zinc	Total	ND	pass
	D4G280388	8/6/2004 7:37:00 PM	Barium	Dissolved	ND	pass
	D4G280388	8/6/2004 7:37:00 PM	Chromium	Dissolved	ND	pass
	D4G280388	8/6/2004 7:37:00 PM	Cobalt	Dissolved	ND	pass
	D4G280388	8/6/2004 7:37:00 PM	Copper	Dissolved	ND	pass
	D4G280388	8/6/2004 7:37:00 PM	Lead	Dissolved	ND	pass
	D4G280388	8/6/2004 7:37:00 PM	Manganese	Dissolved	ND	pass
	D4G280388	8/6/2004 7:37:00 PM	Nickel	Dissolved	ND	pass
	D4G280388	8/6/2004 7:37:00 PM	Selenium	Dissolved	ND	pass
	D4G280388	8/6/2004 7:37:00 PM	Silver	Dissolved	ND	pass
	D4G280388	8/6/2004 7:37:00 PM	Vanadium	Dissolved	ND	pass
	D4G280388	8/6/2004 7:37:00 PM	Zinc	Dissolved	ND	pass
	D4G280388	8/7/2004 5:18:00 AM	Aluminum	Dissolved	ND	pass
	D4G280388	8/7/2004 5:18:00 AM	Calcium	Dissolved	ND	pass
	D4G280388	8/7/2004 5:18:00 AM	Iron	Dissolved	ND	pass
	D4G280388	8/7/2004 5:18:00 AM	Magnesium	Dissolved	ND	pass
	D4G280388	8/7/2004 5:18:00 AM	Potassium	Dissolved	ND	pass
	D4G280388	8/7/2004 5:18:00 AM	Sodium	Dissolved	ND	pass
	D4G280388	8/9/2004 5:34:00 PM	Antimony	Total	ND	pass
	D4G280388	8/9/2004 5:34:00 PM	Arsenic	Total	ND	pass
	D4G280388	8/9/2004 5:34:00 PM	Beryllium	Total	ND	pass
	D4G280388	8/9/2004 5:34:00 PM	Cadmium	Total	ND	pass
	D4G280388	8/9/2004 5:34:00 PM	Thallium	Total	ND	pass
D4K190000595B	D4K190487	11/23/2004 20:44	Aluminum	Total	ND	pass
D4K290000241B	D4K190487	12/1/2004 20:48	Antimony	Total	ND	pass
D4K290000241B	D4K190487	12/1/2004 20:48	Arsenic	Total	ND	pass
D4K190000595B	D4K190487	11/22/2004 19:31	Barium	Total	ND	pass
D4K290000241B	D4K190487	12/1/2004 20:48	Beryllium	Total	ND	pass
D4K290000241B	D4K190487	12/1/2004 20:48	Cadmium	Total	ND	pass
D4K190000595B	D4K190487	11/23/2004 20:44	Calcium	Total	ND	pass
D4K190000595B	D4K190487	11/22/2004 19:31	Chromium	Total	ND	pass
D4K190000595B	D4K190487	11/22/2004 19:31	Cobalt	Total	ND	pass

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

B. GROUNDWATER

Lab Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (ug/L)	QC Acceptance Criteria Evaluation
D4K190000595B	D4K190487	11/22/2004 19:31	Copper	Total	ND	pass
D4K190000595B	D4K190487	11/23/2004 20:44	Iron	Total	ND	pass
D4K190000595B	D4K190487	11/22/2004 19:31	Lead	Total	ND	pass
D4K190000595B	D4K190487	11/23/2004 20:44	Magnesium	Total	ND	pass
D4K190000595B	D4K190487	11/22/2004 19:31	Manganese	Total	ND	pass
D4K240000531B	D4K190487	11/30/2004 12:45	Mercury	Total	ND	pass
D4K190000595B	D4K190487	11/22/2004 19:31	Nickel	Total	ND	pass
D4K190000595B	D4K190487	11/23/2004 20:44	Potassium	Total	ND	pass
D4K190000595B	D4K190487	11/22/2004 19:31	Selenium	Total	ND	pass
D4K190000595B	D4K190487	11/22/2004 19:31	Silver	Total	ND	pass
D4K190000595B	D4K190487	11/23/2004 20:44	Sodium	Total	ND	pass
D4K290000241B	D4K190487	12/1/2004 20:48	Thallium	Total	ND	pass
D4K190000595B	D4K190487	11/22/2004 19:31	Vanadium	Total	ND	pass
D4K190000595B	D4K190487	11/22/2004 19:31	Zinc	Total	ND	pass
D4K190000614B	D4K190487	11/25/2004 11:48	Aluminum	Dissolved	ND	pass
D4K190000616B	D4K190487	12/1/2004 17:49	Antimony	Dissolved	ND	pass
D4K190000616B	D4K190487	12/1/2004 17:49	Arsenic	Dissolved	ND	pass
D4K190000614B	D4K190487	11/29/2004 13:22	Barium	Dissolved	ND	pass
D4K190000616B	D4K190487	12/1/2004 17:49	Beryllium	Dissolved	ND	pass
D4K190000616B	D4K190487	12/1/2004 17:49	Cadmium	Dissolved	ND	pass
D4K190000614B	D4K190487	11/25/2004 11:48	Calcium	Dissolved	ND	pass
D4K190000614B	D4K190487	11/29/2004 13:22	Chromium	Dissolved	ND	pass
D4K190000614B	D4K190487	11/29/2004 13:22	Cobalt	Dissolved	ND	pass
D4K190000614B	D4K190487	11/29/2004 13:22	Copper	Dissolved	ND	pass
D4K190000614B	D4K190487	11/25/2004 11:48	Iron	Dissolved	ND	pass
D4K190000614B	D4K190487	11/29/2004 13:22	Lead	Dissolved	ND	pass
D4K190000614B	D4K190487	11/25/2004 11:48	Magnesium	Dissolved	ND	pass
D4K190000614B	D4K190487	11/25/2004 11:48	Manganese	Dissolved	ND	pass
D4K240000537B	D4K190487	12/2/2004 17:46	Mercury	Dissolved	ND	pass
D4K190000614B	D4K190487	11/29/2004 13:22	Nickel	Dissolved	ND	pass
D4K190000614B	D4K190487	11/25/2004 11:48	Potassium	Dissolved	ND	pass
D4K190000614B	D4K190487	11/29/2004 13:22	Selenium	Dissolved	ND	pass
D4K190000614B	D4K190487	11/29/2004 13:22	Silver	Dissolved	ND	pass
D4K190000614B	D4K190487	11/25/2004 11:48	Sodium	Dissolved	ND	pass
D4K190000616B	D4K190487	12/1/2004 17:49	Thallium	Dissolved	ND	pass
D4K190000614B	D4K190487	11/29/2004 13:22	Vanadium	Dissolved	ND	pass
D4K190000614B	D4K190487	11/25/2004 11:48	Zinc	Dissolved	ND	pass
D5C290000583B	D5C280224	3/31/2005 0:25	Aluminum	Total	ND	pass
D5C290000584B	D5C280224	3/30/2005 22:02	Antimony	Total	ND	pass
D5C290000584B	D5C280224	3/30/2005 22:02	Arsenic	Total	ND	pass
D5C290000583B	D5C280224	3/30/2005 16:11	Barium	Total	ND	pass
D5C290000584B	D5C280224	3/30/2005 22:02	Beryllium	Total	ND	pass
D5C290000584B	D5C280224	3/30/2005 22:02	Cadmium	Total	ND	pass
D5C290000583B	D5C280224	3/31/2005 0:25	Calcium	Total	ND	pass

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

B. GROUNDWATER

Lab Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (ug/L)	QC Acceptance Criteria Evaluation
D5C290000583B	D5C280224	3/30/2005 16:11	Chromium	Total	ND	pass
D5C290000583B	D5C280224	3/30/2005 16:11	Cobalt	Total	ND	pass
D5C290000583B	D5C280224	3/30/2005 16:11	Copper	Total	ND	pass
D5C290000583B	D5C280224	3/31/2005 0:25	Iron	Total	ND	pass
D5C290000583B	D5C280224	3/30/2005 16:11	Lead	Total	ND	pass
D5C290000583B	D5C280224	3/31/2005 0:25	Magnesium	Total	ND	pass
D5C290000583B	D5C280224	3/30/2005 16:11	Manganese	Total	ND	pass
D5C290000109B	D5C280224	3/29/2005 17:51	Mercury	Total	ND	pass
D5C290000583B	D5C280224	3/30/2005 16:11	Nickel	Total	ND	pass
D5C290000583B	D5C280224	3/31/2005 0:25	Potassium	Total	ND	pass
D5C290000583B	D5C280224	3/30/2005 16:11	Selenium	Total	ND	pass
D5C290000583B	D5C280224	3/30/2005 16:11	Silver	Total	ND	pass
D5C290000583B	D5C280224	3/31/2005 0:25	Sodium	Total	ND	pass
D5C290000584B	D5C280224	3/30/2005 22:02	Thallium	Total	ND	pass
D5C290000583B	D5C280224	3/30/2005 16:11	Vanadium	Total	ND	pass
D5C290000583B	D5C280224	3/30/2005 16:11	Zinc	Total	ND	pass
D5E040000197B	D5E020222	5/6/2005 21:54	Aluminum	Dissolved	ND	pass
D5E040000643B	D5E020222	5/9/2005 22:08	Antimony	Dissolved	ND	pass
D5E040000643B	D5E020222	5/9/2005 22:08	Arsenic	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 12:12	Barium	Dissolved	ND	pass
D5E040000643B	D5E020222	5/9/2005 22:08	Beryllium	Dissolved	ND	pass
D5E040000643B	D5E020222	5/9/2005 22:08	Cadmium	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 21:54	Calcium	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 12:12	Chromium	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 12:12	Cobalt	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 12:12	Copper	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 21:54	Iron	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 12:12	Lead	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 21:54	Magnesium	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 12:12	Manganese	Dissolved	ND	pass
D5E090000238B	D5E020222	5/9/2005 17:25	Mercury	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 12:12	Nickel	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 21:54	Potassium	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 12:12	Selenium	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 12:12	Silver	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 21:54	Sodium	Dissolved	ND	pass
D5E040000643B	D5E020222	5/9/2005 22:08	Thallium	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 12:12	Vanadium	Dissolved	ND	pass
D5E040000197B	D5E020222	5/6/2005 12:12	Zinc	Dissolved	ND	pass
D5E040000223B	D5E020222	5/6/2005 19:46	Aluminum	Total	ND	pass
D5E040000644B	D5E020222	5/9/2005 23:07	Antimony	Total	ND	pass
D5E040000644B	D5E020222	5/9/2005 23:07	Arsenic	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 15:03	Barium	Total	ND	pass
D5E040000644B	D5E020222	5/9/2005 23:07	Beryllium	Total	ND	pass

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

B. GROUNDWATER

Lab Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (ug/L)	QC Acceptance Criteria Evaluation
D5E040000644B	D5E020222	5/9/2005 23:07	Cadmium	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 19:46	Calcium	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 15:03	Chromium	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 15:03	Cobalt	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 15:03	Copper	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 19:46	Iron	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 15:03	Lead	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 19:46	Magnesium	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 15:03	Manganese	Total	ND	pass
D5E090000233B	D5E020222	5/9/2005 17:49	Mercury	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 15:03	Nickel	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 19:46	Potassium	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 15:03	Selenium	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 15:03	Silver	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 19:46	Sodium	Total	ND	pass
D5E040000644B	D5E020222	5/9/2005 23:07	Thallium	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 15:03	Vanadium	Total	ND	pass
D5E040000223B	D5E020222	5/6/2005 19:46	Zinc	Total	ND	pass
D5I220000492B	D5I190220	9/27/2005 17:25	Aluminum	Dissolved	ND	pass
D5I220000237B	D5I190220	9/26/2005 20:58	Aluminum	Total	ND	pass
D5I220000527B	D5I190220	9/29/2005 2:23	Antimony	Dissolved	ND	pass
D5I220000193B	D5I190220	9/27/2005 19:44	Antimony	Total	ND	pass
D5I220000527B	D5I190220	9/29/2005 2:23	Arsenic	Dissolved	ND	pass
D5I220000193B	D5I190220	9/27/2005 19:44	Arsenic	Total	ND	pass
D5I220000492B	D5I190220	9/28/2005 2:50	Barium	Dissolved	ND	pass
D5I220000237B	D5I190220	9/28/2005 7:59	Barium	Total	ND	pass
D5I220000527B	D5I190220	9/29/2005 2:23	Beryllium	Dissolved	ND	pass
D5I220000193B	D5I190220	9/27/2005 19:44	Beryllium	Total	ND	pass
D5I220000527B	D5I190220	9/29/2005 2:23	Cadmium	Dissolved	ND	pass
D5I220000193B	D5I190220	9/27/2005 19:44	Cadmium	Total	ND	pass
D5I220000492B	D5I190220	9/27/2005 17:25	Calcium	Dissolved	ND	pass
D5I220000237B	D5I190220	9/26/2005 20:58	Calcium	Total	ND	pass
D5I220000492B	D5I190220	9/28/2005 2:50	Chromium	Dissolved	ND	pass
D5I220000237B	D5I190220	9/28/2005 7:59	Chromium	Total	ND	pass
D5I220000492B	D5I190220	9/28/2005 2:50	Cobalt	Dissolved	ND	pass
D5I220000237B	D5I190220	9/28/2005 7:59	Cobalt	Total	ND	pass
D5I220000492B	D5I190220	9/28/2005 2:50	Copper	Dissolved	ND	pass
D5I220000237B	D5I190220	9/28/2005 7:59	Copper	Total	ND	pass
D5I220000492B	D5I190220	9/27/2005 17:25	Iron	Dissolved	ND	pass
D5I220000237B	D5I190220	9/26/2005 20:58	Iron	Total	ND	pass
D5I220000492B	D5I190220	9/28/2005 2:50	Lead	Dissolved	ND	pass
D5I220000237B	D5I190220	9/28/2005 7:59	Lead	Total	ND	pass
D5I220000492B	D5I190220	9/27/2005 17:25	Magnesium	Dissolved	ND	pass
D5I220000237B	D5I190220	9/26/2005 20:58	Magnesium	Total	ND	pass

E-8. Data Quality Assessment
Evaluation of Method Blank (MB) Results

B. GROUNDWATER

Lab Sample ID	Lot ID	Analyzed	Anayte	Analyte Type	Result (ug/L)	QC Acceptance Criteria Evaluation
D5I220000492B	D5I190220	9/28/2005 2:50	Manganese	Dissolved	ND	pass
D5I220000237B	D5I190220	9/28/2005 7:59	Manganese	Total	ND	pass
D5I220000500B	D5I190220	9/23/2005 17:39	Mercury	Dissolved	ND	pass
D5I260000235B	D5I190220	9/26/2005 17:50	Mercury	Dissolved	ND	pass
D5I260000218B	D5I190220	9/26/2005 17:13	Mercury	Total	ND	pass
D5I220000522B	D5I190220	9/23/2005 18:48	Mercury	Total	ND	pass
D5I220000492B	D5I190220	9/28/2005 2:50	Nickel	Dissolved	ND	pass
D5I220000237B	D5I190220	9/28/2005 7:59	Nickel	Total	ND	pass
D5I220000492B	D5I190220	9/27/2005 17:25	Potassium	Dissolved	ND	pass
D5I220000237B	D5I190220	9/26/2005 20:58	Potassium	Total	ND	pass
D5I220000492B	D5I190220	9/28/2005 2:50	Selenium	Dissolved	ND	pass
D5I220000237B	D5I190220	9/28/2005 7:59	Selenium	Total	ND	pass
D5I220000492B	D5I190220	9/28/2005 2:50	Silver	Dissolved	ND	pass
D5I220000237B	D5I190220	9/28/2005 7:59	Silver	Total	ND	pass
D5I220000492B	D5I190220	9/27/2005 17:25	Sodium	Dissolved	ND	pass
D5I220000237B	D5I190220	9/26/2005 20:58	Sodium	Total	ND	pass
D5I220000527B	D5I190220	9/29/2005 2:23	Thallium	Dissolved	ND	pass
D5I220000193B	D5I190220	9/27/2005 19:44	Thallium	Total	ND	pass
D5I220000492B	D5I190220	9/28/2005 2:50	Vanadium	Dissolved	ND	pass
D5I220000237B	D5I190220	9/28/2005 7:59	Vanadium	Total	ND	pass
D5I220000492B	D5I190220	9/28/2005 2:50	Zinc	Dissolved	ND	pass
D5I220000237B	D5I190220	9/28/2005 7:59	Zinc	Total	ND	pass

Fail = Does not meet QC acceptance criteria (chemical detected above detection limit).
ND = Concentration not detected at concentrations above the reporting limit.
Pass = Results are within QC acceptance criteria (below detection limit).
QC = Quality Control

APPENDIX F

NATURE AND EXTENT OF SOIL CONTAMINATION

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USGS Background Concentrations of Metals in Soil
and
Derivation of the 99th Percentile Background Concentration

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Table F-1. Raw Background Data from Schacklette and Boerngen (1984)
(Arapahoe, Clear Creek, Douglas, Elbert, Jefferson, Park and Weld Counties in Colorado)

PRIME_ID	County	Latitude	Longitude	Date Collected	Analyte	Units	Concentration	Qualifier	Concentration (ppm)	Non-detect Adjusted Concentration (ppm)
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Aluminum	%	7	--	70000	70000
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Aluminum	%	10	G	100000	100000
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Aluminum	%	10	G	100000	100000
GC170050	Douglas	39.25	104.8833	01-May-64	Aluminum	%	10	G	100000	100000
GC085050	Elbert	39.55	104.4	01-Jun-75	Aluminum	%	5	--	50000	50000
GC085150	Elbert	39.1333	104.15	01-Jun-75	Aluminum	%	3	--	30000	30000
GC016950	Jefferson	39.3667	105.25	01-May-62	Aluminum	%	7	--	70000	70000
GC155150	Jefferson	39.65	105.2	01-Jul-63	Aluminum	%	7	--	70000	70000
GC033350	Park	40.4	106.6333	01-Aug-65	Aluminum	%	10	G	100000	100000
GC155050	Park	39.45	105.7	01-Jul-63	Aluminum	%	3	--	30000	30000
GC181450	Park	39.2167	106	01-Jul-64	Aluminum	%	7	--	70000	70000
GC263250	Weld	40.8833	104.7833	01-Aug-68	Aluminum	%	5	--	50000	50000
GC268750	Weld	40.9833	103.7	01-Aug-68	Aluminum	%	1.5	--	15000	15000
GC268850	Weld	40.6333	104.0833	01-Aug-68	Aluminum	%	10	--	100000	100000
GC085050	Elbert	39.55	104.4	01-Jun-75	Antimony	PPM	1	L	1	1
GC085150	Elbert	39.1333	104.15	01-Jun-75	Antimony	PPM	1	L	1	1
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Arsenic	PPM	7.5	--	7.5	7.5
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Arsenic	PPM	6.6	--	6.6	6.6
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Arsenic	PPM	3.2	--	3.2	3.2
GC170050	Douglas	39.25	104.8833	01-May-64	Arsenic	PPM	3.2	--	3.2	3.2
GC085050	Elbert	39.55	104.4	01-Jun-75	Arsenic	PPM	4.73	--	4.73	4.73
GC085150	Elbert	39.1333	104.15	01-Jun-75	Arsenic	PPM	4.145	--	4.145	4.145
GC155150	Jefferson	39.65	105.2	01-Jul-63	Arsenic	PPM	10	--	10	10
GC033350	Park	40.4	106.6333	01-Aug-65	Arsenic	PPM	3.3	--	3.3	3.3
GC155050	Park	39.45	105.7	01-Jul-63	Arsenic	PPM	4	--	4	4
GC263250	Weld	40.8833	104.7833	01-Aug-68	Arsenic	PPM	9.1	--	9.1	9.1
GC268750	Weld	40.9833	103.7	01-Aug-68	Arsenic	PPM	5	--	5	5
GC268850	Weld	40.6333	104.0833	01-Aug-68	Arsenic	PPM	4.5	--	4.5	4.5

Table F-1. Raw Background Data from Schacklette and Boerngen (1984)
(Arapahoe, Clear Creek, Douglas, Elbert, Jefferson, Park and Weld Counties in Colorado)

PRIME_ID	County	Latitude	Longitude	Date Collected	Analyte	Units	Concentration	Qualifier	Concentration (ppm)	Non-detect Adjusted Concentration (ppm)
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Barium	PPM	700	--	700	700
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Barium	PPM	700	--	700	700
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Barium	PPM	700	--	700	700
GC170050	Douglas	39.25	104.8833	01-May-64	Barium	PPM	2000	--	2000	2000
GC085050	Elbert	39.55	104.4	01-Jun-75	Barium	PPM	700	--	700	700
GC085150	Elbert	39.1333	104.15	01-Jun-75	Barium	PPM	700	--	700	700
GC016950	Jefferson	39.3667	105.25	01-May-62	Barium	PPM	1000	--	1000	1000
GC155150	Jefferson	39.65	105.2	01-Jul-63	Barium	PPM	700	--	700	700
GC033350	Park	40.4	106.6333	01-Aug-65	Barium	PPM	700	--	700	700
GC155050	Park	39.45	105.7	01-Jul-63	Barium	PPM	500	--	500	500
GC181450	Park	39.2167	106	01-Jul-64	Barium	PPM	500	--	500	500
GC263250	Weld	40.8833	104.7833	01-Aug-68	Barium	PPM	700	--	700	700
GC268750	Weld	40.9833	103.7	01-Aug-68	Barium	PPM	700	--	700	700
GC268850	Weld	40.6333	104.0833	01-Aug-68	Barium	PPM	300	--	300	300
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Beryllium	PPM	1.5	--	1.5	1.5
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Beryllium	PPM	5	--	5	5
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Beryllium	PPM	1	N	1	0.5
GC170050	Douglas	39.25	104.8833	01-May-64	Beryllium	PPM	3	--	3	3
GC085050	Elbert	39.55	104.4	01-Jun-75	Beryllium	PPM	1	--	1	1
GC085150	Elbert	39.1333	104.15	01-Jun-75	Beryllium	PPM	1	N	1	0.5
GC016950	Jefferson	39.3667	105.25	01-May-62	Beryllium	PPM	5	--	5	5
GC155150	Jefferson	39.65	105.2	01-Jul-63	Beryllium	PPM	2	--	2	2
GC033350	Park	40.4	106.6333	01-Aug-65	Beryllium	PPM	1	N	1	0.5
GC155050	Park	39.45	105.7	01-Jul-63	Beryllium	PPM	1	N	1	0.5
GC181450	Park	39.2167	106	01-Jul-64	Beryllium	PPM	1	N	1	0.5
GC263250	Weld	40.8833	104.7833	01-Aug-68	Beryllium	PPM	1	N	1	0.5
GC268750	Weld	40.9833	103.7	01-Aug-68	Beryllium	PPM	1	N	1	0.5
GC268850	Weld	40.6333	104.0833	01-Aug-68	Beryllium	PPM	1.5	--	1.5	1.5

Table F-1. Raw Background Data from Schacklette and Boerngen (1984)
(Arapahoe, Clear Creek, Douglas, Elbert, Jefferson, Park and Weld Counties in Colorado)

PRIME_ID	County	Latitude	Longitude	Date Collected	Analyte	Units	Concentration	Qualifier	Concentration (ppm)	Non-detect Adjusted Concentration (ppm)
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Calcium	%	0.76	--	7600	7600
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Calcium	%	0.7	--	7000	7000
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Calcium	%	0.9	--	9000	9000
GC170050	Douglas	39.25	104.8833	01-May-64	Calcium	%	0.72	--	7200	7200
GC085050	Elbert	39.55	104.4	01-Jun-75	Calcium	%	0.463	--	4630	4630
GC085150	Elbert	39.1333	104.15	01-Jun-75	Calcium	%	1.7617	--	17617	17617
GC016950	Jefferson	39.3667	105.25	01-May-62	Calcium	%	1.1	--	11000	11000
GC155150	Jefferson	39.65	105.2	01-Jul-63	Calcium	%	1.1	--	11000	11000
GC033350	Park	40.4	106.6333	01-Aug-65	Calcium	%	1.2	--	12000	12000
GC155050	Park	39.45	105.7	01-Jul-63	Calcium	%	1.5	--	15000	15000
GC181450	Park	39.2167	106	01-Jul-64	Calcium	%	1.1	--	11000	11000
GC263250	Weld	40.8833	104.7833	01-Aug-68	Calcium	%	0.55	--	5500	5500
GC268750	Weld	40.9833	103.7	01-Aug-68	Calcium	%	32	--	320000	320000
GC268850	Weld	40.6333	104.0833	01-Aug-68	Calcium	%	4.9	--	49000	49000
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Chromium	PPM	50	--	50	50
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Chromium	PPM	50	--	50	50
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Chromium	PPM	30	--	30	30
GC170050	Douglas	39.25	104.8833	01-May-64	Chromium	PPM	20	--	20	20
GC085050	Elbert	39.55	104.4	01-Jun-75	Chromium	PPM	20	--	20	20
GC085150	Elbert	39.1333	104.15	01-Jun-75	Chromium	PPM	50	--	50	50
GC016950	Jefferson	39.3667	105.25	01-May-62	Chromium	PPM	30	--	30	30
GC155150	Jefferson	39.65	105.2	01-Jul-63	Chromium	PPM	50	--	50	50
GC033350	Park	40.4	106.6333	01-Aug-65	Chromium	PPM	50	--	50	50
GC155050	Park	39.45	105.7	01-Jul-63	Chromium	PPM	50	--	50	50
GC181450	Park	39.2167	106	01-Jul-64	Chromium	PPM	50	--	50	50
GC263250	Weld	40.8833	104.7833	01-Aug-68	Chromium	PPM	20	--	20	20
GC268750	Weld	40.9833	103.7	01-Aug-68	Chromium	PPM	10	--	10	10
GC268850	Weld	40.6333	104.0833	01-Aug-68	Chromium	PPM	30	--	30	30

Table F-1. Raw Background Data from Schacklette and Boerngen (1984)
(Arapahoe, Clear Creek, Douglas, Elbert, Jefferson, Park and Weld Counties in Colorado)

PRIME_ID	County	Latitude	Longitude	Date Collected	Analyte	Units	Concentration	Qualifier	Concentration (ppm)	Non-detect Adjusted Concentration (ppm)
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Cobalt	PPM	7	--	7	7
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Cobalt	PPM	15	--	15	15
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Cobalt	PPM	10	--	10	10
GC170050	Douglas	39.25	104.8833	01-May 64	Cobalt	PPM	5	--	5	5
GC085050	Elbert	39.55	104.4	01-Jun-75	Cobalt	PPM	7	--	7	7
GC085150	Elbert	39.1333	104.15	01-Jun-75	Cobalt	PPM	5	--	5	5
GC016950	Jefferson	39.3667	105.25	01-May-62	Cobalt	PPM	10	--	10	10
GC155150	Jefferson	39.65	105.2	01-Jul-63	Cobalt	PPM	7	--	7	7
GC033350	Park	40.4	106.6333	01-Aug-65	Cobalt	PPM	15	--	15	15
GC155050	Park	39.45	105.7	01-Jul-63	Cobalt	PPM	3	N	3	1.5
GC181450	Park	39.2167	106	01-Jul-64	Cobalt	PPM	7	--	7	7
GC263250	Weld	40.8833	104.7833	01-Aug-68	Cobalt	PPM	3	--	3	3
GC268750	Weld	40.9833	103.7	01-Aug-68	Cobalt	PPM	3	--	3	3
GC268850	Weld	40.6333	104.0833	01-Aug-68	Cobalt	PPM	3	--	3	3
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Copper	PPM	20	--	20	20
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Copper	PPM	30	--	30	30
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Copper	PPM	15	--	15	15
GC170050	Douglas	39.25	104.8833	01-May-64	Copper	PPM	15	--	15	15
GC085050	Elbert	39.55	104.4	01-Jun-75	Copper	PPM	15	--	15	15
GC085150	Elbert	39.1333	104.15	01-Jun-75	Copper	PPM	7	--	7	7
GC016950	Jefferson	39.3667	105.25	01-May-62	Copper	PPM	50	--	50	50
GC155150	Jefferson	39.65	105.2	01-Jul-63	Copper	PPM	50	--	50	50
GC033350	Park	40.4	106.6333	01-Aug-65	Copper	PPM	30	--	30	30
GC155050	Park	39.45	105.7	01-Jul-63	Copper	PPM	30	--	30	30
GC181450	Park	39.2167	106	01-Jul-64	Copper	PPM	10	--	10	10
GC263250	Weld	40.8833	104.7833	01-Aug-68	Copper	PPM	15	--	15	15
GC268750	Weld	40.9833	103.7	01-Aug-68	Copper	PPM	15	--	15	15
GC268850	Weld	40.6333	104.0833	01-Aug-68	Copper	PPM	15	--	15	15

Table F-1. Raw Background Data from Schacklette and Boerngen (1984)
(Arapahoe, Clear Creek, Douglas, Elbert, Jefferson, Park and Weld Counties in Colorado)

PRIME_ID	County	Latitude	Longitude	Date Collected	Analyte	Units	Concentration	Qualifier	Concentration (ppm)	Non-detect Adjusted Concentration (ppm)
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Iron	%	3	--	30000	30000
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Iron	%	2	--	20000	20000
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Iron	%	2	--	20000	20000
GC170050	Douglas	39.25	104.8833	01-May-64	Iron	%	1.5	--	15000	15000
GC085050	Elbert	39.55	104.4	01-Jun-75	Iron	%	1	--	10000	10000
GC085150	Elbert	39.1333	104.15	01-Jun-75	Iron	%	1	--	10000	10000
GC016950	Jefferson	39.3667	105.25	01-May-62	Iron	%	7	--	70000	70000
GC155150	Jefferson	39.65	105.2	01-Jul-63	Iron	%	3	--	30000	30000
GC033350	Park	40.4	106.6333	01-Aug-65	Iron	%	3	--	30000	30000
GC155050	Park	39.45	105.7	01-Jul-63	Iron	%	1.5	--	15000	15000
GC181450	Park	39.2167	106	01-Jul-64	Iron	%	2	--	20000	20000
GC263250	Weld	40.8833	104.7833	01-Aug-68	Iron	%	2	--	20000	20000
GC268750	Weld	40.9833	103.7	01-Aug-68	Iron	%	0.7	--	7000	7000
GC268850	Weld	40.6333	104.0833	01-Aug-68	Iron	%	2	--	20000	20000
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Lead	PPM	30	--	30	30
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Lead	PPM	50	--	50	50
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Lead	PPM	50	--	50	50
GC170050	Douglas	39.25	104.8833	01-May-64	Lead	PPM	50	--	50	50
GC085050	Elbert	39.55	104.4	01-Jun-75	Lead	PPM	30	--	30	30
GC085150	Elbert	39.1333	104.15	01-Jun-75	Lead	PPM	15	--	15	15
GC016950	Jefferson	39.3667	105.25	01-May-62	Lead	PPM	100	--	100	100
GC155150	Jefferson	39.65	105.2	01-Jul-63	Lead	PPM	70	--	70	70
GC033350	Park	40.4	106.6333	01-Aug-65	Lead	PPM	50	--	50	50
GC155050	Park	39.45	105.7	01-Jul-63	Lead	PPM	30	--	30	30
GC181450	Park	39.2167	106	01-Jul-64	Lead	PPM	70	--	70	70
GC263250	Weld	40.8833	104.7833	01-Aug-68	Lead	PPM	20	--	20	20
GC268750	Weld	40.9833	103.7	01-Aug-68	Lead	PPM	10	--	10	10
GC268850	Weld	40.6333	104.0833	01-Aug-68	Lead	PPM	15	--	15	15

Table F-1. Raw Background Data from Schacklette and Boerngen (1984)
(Arapahoe, Clear Creek, Douglas, Elbert, Jefferson, Park and Weld Counties in Colorado)

PRIME_ID	County	Latitude	Longitude	Date Collected	Analyte	Units	Concentration	Qualifier	Concentration (ppm)	Non-detect Adjusted Concentration (ppm)
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Magnesium	%	0.7	--	7000	7000
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Magnesium	%	0.7	--	7000	7000
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Magnesium	%	0.5	--	5000	5000
GC170050	Douglas	39.25	104.8833	01-May-64	Magnesium	%	0.3	--	3000	3000
GC085050	Elbert	39.55	104.4	01-Jun-75	Magnesium	%	0.3	--	3000	3000
GC085150	Elbert	39.1333	104.15	01-Jun-75	Magnesium	%	0.5	--	5000	5000
GC016950	Jefferson	39.3667	105.25	01-May-62	Magnesium	%	1	--	10000	10000
GC155150	Jefferson	39.65	105.2	01-Jul-63	Magnesium	%	0.7	--	7000	7000
GC033350	Park	40.4	106.6333	01-Aug-65	Magnesium	%	1	--	10000	10000
GC155050	Park	39.45	105.7	01-Jul-63	Magnesium	%	0.5	--	5000	5000
GC181450	Park	39.2167	106	01-Jul-64	Magnesium	%	0.5	--	5000	5000
GC263250	Weld	40.8833	104.7833	01-Aug-68	Magnesium	%	0.3	--	3000	3000
GC268750	Weld	40.9833	103.7	01-Aug-68	Magnesium	%	0.7	--	7000	7000
GC268850	Weld	40.6333	104.0833	01-Aug-68	Magnesium	%	1.5	--	15000	15000
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Manganese	PPM	300	--	300	300
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Manganese	PPM	700	--	700	700
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Manganese	PPM	500	--	500	500
GC170050	Douglas	39.25	104.8833	01-May-64	Manganese	PPM	200	--	200	200
GC085050	Elbert	39.55	104.4	01-Jun-75	Manganese	PPM	300	--	300	300
GC085150	Elbert	39.1333	104.15	01-Jun-75	Manganese	PPM	150	--	150	150
GC016950	Jefferson	39.3667	105.25	01-May-62	Manganese	PPM	1000	--	1000	1000
GC155150	Jefferson	39.65	105.2	01-Jul-63	Manganese	PPM	500	--	500	500
GC033350	Park	40.4	106.6333	01-Aug-65	Manganese	PPM	500	--	500	500
GC155050	Park	39.45	105.7	01-Jul-63	Manganese	PPM	300	--	300	300
GC181450	Park	39.2167	106	01-Jul-64	Manganese	PPM	300	--	300	300
GC263250	Weld	40.8833	104.7833	01-Aug-68	Manganese	PPM	300	--	300	300
GC268750	Weld	40.9833	103.7	01-Aug-68	Manganese	PPM	70	--	70	70
GC268850	Weld	40.6333	104.0833	01-Aug-68	Manganese	PPM	300	--	300	300

Table F-1. Raw Background Data from Schacklette and Boerngen (1984)
(Arapahoe, Clear Creek, Douglas, Elbert, Jefferson, Park and Weld Counties in Colorado)

PRIME_ID	County	Latitude	Longitude	Date Collected	Analyte	Units	Concentration	Qualifier	Concentration (ppm)	Non-detect Adjusted Concentration (ppm)
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Mercury	PPM	0.04	--	0.04	0.04
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Mercury	PPM	0.06	--	0.06	0.06
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Mercury	PPM	0.03	--	0.03	0.03
GC170050	Douglas	39.25	104.8833	01-May-64	Mercury	PPM	0.1	--	0.1	0.1
GC085050	Elbert	39.55	104.4	01-Jun-75	Mercury	PPM	0.04	--	0.04	0.04
GC085150	Elbert	39.1333	104.15	01-Jun-75	Mercury	PPM	0.04	--	0.04	0.04
GC155150	Jefferson	39.65	105.2	01-Jul-63	Mercury	PPM	0.18	--	0.18	0.18
GC033350	Park	40.4	106.6333	01-Aug-65	Mercury	PPM	0.04	--	0.04	0.04
GC155050	Park	39.45	105.7	01-Jul-63	Mercury	PPM	1.3	--	1.3	1.3
GC263250	Weld	40.8833	104.7833	01-Aug-68	Mercury	PPM	0.02	--	0.02	0.02
GC268750	Weld	40.9833	103.7	01-Aug-68	Mercury	PPM	0.03	--	0.03	0.03
GC268850	Weld	40.6333	104.0833	01-Aug-68	Mercury	PPM	0.01	--	0.01	0.01
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Nickel	PPM	20	--	20	20
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Nickel	PPM	15	--	15	15
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Nickel	PPM	15	--	15	15
GC170050	Douglas	39.25	104.8833	01-May-64	Nickel	PPM	15	--	15	15
GC085050	Elbert	39.55	104.4	01-Jun-75	Nickel	PPM	7	--	7	7
GC085150	Elbert	39.1333	104.15	01-Jun-75	Nickel	PPM	7	--	7	7
GC016950	Jefferson	39.3667	105.25	01-May-62	Nickel	PPM	20	--	20	20
GC155150	Jefferson	39.65	105.2	01-Jul-63	Nickel	PPM	20	--	20	20
GC033350	Park	40.4	106.6333	01-Aug-65	Nickel	PPM	20	--	20	20
GC155050	Park	39.45	105.7	01-Jul-63	Nickel	PPM	7	--	7	7
GC181450	Park	39.2167	106	01-Jul-64	Nickel	PPM	15	--	15	15
GC263250	Weld	40.8833	104.7833	01-Aug-68	Nickel	PPM	7	--	7	7
GC268750	Weld	40.9833	103.7	01-Aug-68	Nickel	PPM	7	--	7	7
GC268850	Weld	40.6333	104.0833	01-Aug-68	Nickel	PPM	10	--	10	10
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Phosphorus	%	0.044	--	440	440
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Phosphorus	%	0.016	--	160	160

Table F-1. Raw Background Data from Schacklette and Boerngen (1984)
(Arapahoe, Clear Creek, Douglas, Elbert, Jefferson, Park and Weld Counties in Colorado)

PRIME_ID	County	Latitude	Longitude	Date Collected	Analyte	Units	Concentration	Qualifier	Concentration (ppm)	Non-detect Adjusted Concentration (ppm)
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Phosphorus	%	0.016	--	160	160
GC170050	Douglas	39.25	104.8833	01-May-64	Phosphorus	%	0.02	--	200	200
GC016950	Jefferson	39.3667	105.25	01-May-62	Phosphorus	%	0.0899	--	899	899
GC155150	Jefferson	39.65	105.2	01-Jul-63	Phosphorus	%	0.024	--	240	240
GC033350	Park	40.4	106.6333	01-Aug-65	Phosphorus	%	0.016	--	160	160
GC155050	Park	39.45	105.7	01-Jul-63	Phosphorus	%	0.1199	--	1199	1199
GC181450	Park	39.2167	106	01-Jul-64	Phosphorus	%	0.03	--	300	300
GC263250	Weld	40.8833	104.7833	01-Aug-68	Phosphorus	%	0.016	--	160	160
GC268750	Weld	40.9833	103.7	01-Aug-68	Phosphorus	%	0.016	--	160	160
GC268850	Weld	40.6333	104.0833	01-Aug-68	Phosphorus	%	0.024	--	240	240
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Potassium	%	2.6	--	26000	26000
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Potassium	%	3.1	--	31000	31000
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Potassium	%	3	--	30000	30000
GC170050	Douglas	39.25	104.8833	01-May-64	Potassium	%	6.3	--	63000	63000
GC085050	Elbert	39.55	104.4	01-Jun-75	Potassium	%	2.6473	--	26473	26473
GC085150	Elbert	39.1333	104.15	01-Jun-75	Potassium	%	1.828	--	18280	18280
GC016950	Jefferson	39.3667	105.25	01-May-62	Potassium	%	2.8	--	28000	28000
GC155150	Jefferson	39.65	105.2	01-Jul-63	Potassium	%	2.7	--	27000	27000
GC033350	Park	40.4	106.6333	01-Aug-65	Potassium	%	2.5	--	25000	25000
GC155050	Park	39.45	105.7	01-Jul-63	Potassium	%	2	--	20000	20000
GC181450	Park	39.2167	106	01-Jul-64	Potassium	%	2.5	--	25000	25000
GC263250	Weld	40.8833	104.7833	01-Aug-68	Potassium	%	2.9	--	29000	29000
GC268750	Weld	40.9833	103.7	01-Aug-68	Potassium	%	0.85	--	8500	8500
GC268850	Weld	40.6333	104.0833	01-Aug-68	Potassium	%	2.5	--	25000	25000
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Selenium	PPM	0.603	--	0.603	0.603
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Selenium	PPM	0.3706	--	0.3706	0.3706
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Selenium	PPM	0.3694	--	0.3694	0.3694
GC170050	Douglas	39.25	104.8833	01-May-64	Selenium	PPM	0.2602	--	0.2602	0.2602

Table F-1. Raw Background Data from Schacklette and Boerngen (1984)
(Arapahoe, Clear Creek, Douglas, Elbert, Jefferson, Park and Weld Counties in Colorado)

PRIME_ID	County	Latitude	Longitude	Date Collected	Analyte	Units	Concentration	Qualifier	Concentration (ppm)	Non-detect Adjusted Concentration (ppm)
GC085050	Elbert	39.55	104.4	01-Jun-75	Selenium	PPM	0.1	L	0.1	0.1
GC085150	Elbert	39.1333	104.15	01-Jun-75	Selenium	PPM	0.1	L	0.1	0.1
GC155150	Jefferson	39.65	105.2	01-Jul-63	Selenium	PPM	0.5365	--	0.5365	0.5365
GC033350	Park	40.4	106.6333	01-Aug-65	Selenium	PPM	0.1269	--	0.1269	0.1269
GC155050	Park	39.45	105.7	01-Jul-63	Selenium	PPM	0.5236	--	0.5236	0.5236
GC263250	Weld	40.8833	104.7833	01-Aug-68	Selenium	PPM	0.1725	--	0.1725	0.1725
GC268750	Weld	40.9833	103.7	01-Aug-68	Selenium	PPM	0.5135	--	0.5135	0.5135
GC268850	Weld	40.6333	104.0833	01-Aug-68	Selenium	PPM	0.4412	--	0.4412	0.4412
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Sodium	%	1.5	--	15000	15000
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Sodium	%	1.5	--	15000	15000
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Sodium	%	2	--	20000	20000
GC170050	Douglas	39.25	104.8833	01-May-64	Sodium	%	1	--	10000	10000
GC085050	Elbert	39.55	104.4	01-Jun-75	Sodium	%	0.7	--	7000	7000
GC085150	Elbert	39.1333	104.15	01-Jun-75	Sodium	%	0.7	--	7000	7000
GC016950	Jefferson	39.3667	105.25	01-May-62	Sodium	%	1.5	--	15000	15000
GC155150	Jefferson	39.65	105.2	01-Jul-63	Sodium	%	2	--	20000	20000
GC033350	Park	40.4	106.6333	01-Aug-65	Sodium	%	2	--	20000	20000
GC155050	Park	39.45	105.7	01-Jul-63	Sodium	%	2	--	20000	20000
GC181450	Park	39.2167	106	01-Jul-64	Sodium	%	1	--	10000	10000
GC263250	Weld	40.8833	104.7833	01-Aug-68	Sodium	%	1	--	10000	10000
GC268750	Weld	40.9833	103.7	01-Aug-68	Sodium	%	0.7	--	7000	7000
GC268850	Weld	40.6333	104.0833	01-Aug-68	Sodium	%	1	--	10000	10000
GC085050	Elbert	39.55	104.4	01-Jun-75	Thallium	PPM	14.78	--	14.78	14.78
GC085150	Elbert	39.1333	104.15	01-Jun-75	Thallium	PPM	13.1	--	13.1	13.1
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Vanadium	PPM	100	--	100	100
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Vanadium	PPM	70	--	70	70
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Vanadium	PPM	50	--	50	50
GC170050	Douglas	39.25	104.8833	01-May-64	Vanadium	PPM	50	--	50	50

Table F-1. Raw Background Data from Schacklette and Boerngen (1984)
(Arapahoe, Clear Creek, Douglas, Elbert, Jefferson, Park and Weld Counties in Colorado)

PRIME_ID	County	Latitude	Longitude	Date Collected	Analyte	Units	Concentration	Qualifier	Concentration (ppm)	Non-detect Adjusted Concentration (ppm)
GC085050	Elbert	39.55	104.4	01-Jun-75	Vanadium	PPM	50	--	50	50
GC085150	Elbert	39.1333	104.15	01-Jun-75	Vanadium	PPM	50	--	50	50
GC016950	Jefferson	39.3667	105.25	01-May-62	Vanadium	PPM	100	--	100	100
GC155150	Jefferson	39.65	105.2	01-Jul-63	Vanadium	PPM	70	--	70	70
GC033350	Park	40.4	106.6333	01-Aug-65	Vanadium	PPM	70	--	70	70
GC155050	Park	39.45	105.7	01-Jul-63	Vanadium	PPM	50	--	50	50
GC181450	Park	39.2167	106	01-Jul-64	Vanadium	PPM	70	--	70	70
GC263250	Weld	40.8833	104.7833	01-Aug-68	Vanadium	PPM	50	--	50	50
GC268750	Weld	40.9833	103.7	01-Aug-68	Vanadium	PPM	20	--	20	20
GC268850	Weld	40.6333	104.0833	01-Aug-68	Vanadium	PPM	50	--	50	50
GC157150	Arapahoe	39.6167	104.25	01-Oct-63	Zinc	PPM	50	--	50	50
GC033150	Clear Creek	39.7833	105.7833	01-Aug-65	Zinc	PPM	70	--	70	70
GC033250	Clear Creek	40.05	106.15	01-Aug-65	Zinc	PPM	40	--	40	40
GC170050	Douglas	39.25	104.8833	01-May-64	Zinc	PPM	50	--	50	50
GC085050	Elbert	39.55	104.4	01-Jun-75	Zinc	PPM	65	--	65	65
GC085150	Elbert	39.1333	104.15	01-Jun-75	Zinc	PPM	51	--	51	51
GC016950	Jefferson	39.3667	105.25	01-May-62	Zinc	PPM	400	--	400	400
GC155150	Jefferson	39.65	105.2	01-Jul-63	Zinc	PPM	200	--	200	200
GC033350	Park	40.4	106.6333	01-Aug-65	Zinc	PPM	60	--	60	60
GC155050	Park	39.45	105.7	01-Jul-63	Zinc	PPM	250	--	250	250
GC181450	Park	39.2167	106	01-Jul-64	Zinc	PPM	100	--	100	100
GC263250	Weld	40.8833	104.7833	01-Aug-68	Zinc	PPM	30	--	30	30
GC268750	Weld	40.9833	103.7	01-Aug-68	Zinc	PPM	20	--	20	20
GC268850	Weld	40.6333	104.0833	01-Aug-68	Zinc	PPM	35	--	35	35

N -- not detected at concentrations above the detection limit

G -- measured at a concentration greater than the upper determination limit for the technique

L -- detected by the technique, but at a level below the detection limit

DRAGUN (1988) BACKGROUND DATA RANGES

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Table F-2. Summary Statistics for Metals in Background Soil
(Arapahoe, Clear Creek, Douglas, Elbert, Jefferson, Park and Weld County)

Chemical	Samples (n)	Geometric Mean (GM)	Geometric Standard Deviation	99th Percentile Concentration (mg/kg)
Aluminum	14	60143.7	1.8	230917.7
Antimony	2	1	1	1
Arsenic	12	5.0	1.5	12.7
Barium	14	694.3	1.5	1797.0
Beryllium	14	1.1	2.5	8.7
Cadmium	0	--	--	--
Calcium	14	13366.3	2.9	164986.4
Chromium	14	32.8	1.7	108.1
Cobalt	14	5.8	1.9	27.3
Copper	14	19.4	1.8	73.3
Iron	14	19240.1	1.8	72972.9
Lead	14	34.7	2.0	167.8
Magnesium	14	5892.0	1.6	18098.9
Manganese	14	322.9	1.9	1493.7
Mercury	12	0.1	3.4	1.0
Nickel	14	12.1	1.6	35.0
Potassium	14	25254.6	1.5	67031.1
Selenium	12	0.3	2.0	1.4
Silver	0	--	--	--
Sodium	14	12318.3	1.5	31987.6
Thallium	2	13.9	1.1	17.0
Vanadium	14	56.9	1.5	142.3
Zinc	14	69.3	2.3	496.5

99th Percentile Concentration = GM * $GSD^{2.326}$

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Table F-3. Typical Range of Native Soil Concentrations of Various Elements

Chemical	Typical Range (mg/kg)
Aluminum	10,000 - 300,000
Antimony	0.6 - 10
Arsenic	1 - 40
Barium	100 - 3500
Beryllium	0.1 - 40
Cadmium	0.01 - 7
Calcium	100 - 400,000
Chromium	5 - 3000
Cobalt	1 - 40
Copper	2 - 100
Iron	7,000 - 550,000
Lead	2 - 200
Magnesium	600 - 6,000
Manganese	100 - 4,000
Mercury	0.01 - 0.08
Nickel	5 - 1,000
Phosphorus	50 - 5,000
Potassium	400 - 30,000
Selenium	0.1 - 2
Silver	0.1 - 5
Sodium	750 - 7,500
Thallium	0.1 - 12
Vanadium	20 - 500
Zinc	10- 300

Source: Dragun (1988). Based on an analysis of Bear et al. (1955), Fairbridge et al. (1979), Polemio et al. (1982), Allaway (1968), Lisk (1972), Page et al. (1979).

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Comparison of Chemicals in Site Soil (by Station) to Background

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All soil concentrations are shown as mg/kg.

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SAMPLE	STATION	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
BACKGROUND [1]		*230,918*	*10.0*	*12.7*	*1797*	*8.7*	*7*	*27.3*	*73.3*	*72,973*	*167.8*	*18,098.9*	*1493.7*	*0.96*	*35*	*67,031*	*1.4*	*5.0*	*31,988*	*12.0*	*142.0*	*497*
01-VBOU3-SB-0001-B	001	20,000	0.5	4.3	100	0.76	0.25	15	11	18,000	11	4,200	250	0.0165	12	1,700	0.65	0.5	250	0.6	44	58
01-VBOU3-SB-0001-C	001	31,000	0.5	3.8	180	0.95	0.25	15	11	28,000	16	5,100	570	0.0165	15	1,400	0.65	0.5	1,200	0.6	46	69
01-VBOU3-SB-0001-D	001	30,000	0.5	0.5	29	1.1	0.25	3.6	16	22,000	18	4,100	230	0.0165	7	1,400	0.65	0.5	1,300	0.6	33	50
01-VBOU3-SB-0002-A	002	16,000	0.5	5.1	350	0.25	0.25	9.5	3.8	15,000	8.9	3,200	340	0.0165	6.5	810	0.65	0.5	660	0.6	38	46
01-VBOU3-SB-0002-B	002	21,000	0.5	3.7	160	0.25	0.25	15	5	18,000	9	3,600	330	0.0165	9.4	870	0.65	0.5	780	0.6	49	54
01-VBOU3-SB-0002-C	002	28,000	0.5	1.1	36	0.96	0.25	5.2	8.7	20,000	30	4,500	400	0.0165	8.9	1,800	0.65	0.5	1,300	0.6	36	53
01-VBOU3-SB-0002-D	002	25,000	0.5	6.9	310	0.56	0.25	10	7.7	29,000	71	3,800	350	0.0165	7.6	1,400	0.65	0.5	1,600	0.6	51	71
01-VBOU3-SB-0003-A	003	15,000	0.5	12	320	1.9	0.25	8.3	**1300**	21,000	**270**	2,000	550	0.0165	12	950	0.65	**13**	1,500	0.6	28	80
01-VBOU3-SB-0003-B	003	24,000	0.5	1.4	500	0.62	0.25	4.4	10	17,000	11	4,600	290	0.0165	5.9	1,500	0.65	0.5	1,000	0.6	37	45
01-VBOU3-SB-0003-C	003	24,000	0.5	5.9	580	0.71	0.25	13	8.6	18,000	10	5,000	310	0.0165	9.5	1,500	0.65	0.5	1,500	0.6	38	53
01-VBOU3-SB-0003-D	003	28,000	0.5	9	330	1	0.25	11	11	22,000	13	5,000	440	0.0165	10	1,900	0.65	0.5	2,200	0.6	55	68
01-VBOU3-SB-0004-A	004	7,400	0.5	**18**	160	0.25	3.2	4.6	**200**	10,000	**190**	1,600	180	0.14	7.7	1,200	0.65	2.1	250	0.6	23	210
01-VBOU3-SB-0004-B	004	13,000	0.5	2.4	74	0.25	0.25	4.9	12	16,000	11	2,400	210	0.0165	8	2,600	0.65	0.5	250	0.6	31	43
01-VBOU3-SB-0004-C	004	17,000	0.5	6	410	0.25	**150**	7.9	10	16,000	9.4	3,000	150	0.0165	10	1,600	0.65	0.5	1,200	1.2	33	**2100**
01-VBOU3-SB-0004-D	004	28,000	0.5	2.5	570	0.64	**73**	6.1	10	26,000	8.5	3,700	360	0.0165	8	1,300	0.65	0.5	2,200	0.6	51	**700**
01-VBOU3-SB-0005-A	005	8,100	0.5	**28**	280	0.95	0.73	5.9	**710**	11,000	160	1,600	230	0.12	8.3	950	0.65	**12**	940	0.6	20	150
01-VBOU3-SB-0005-B	005	17,000	0.5	6.2	720	0.25	0.25	7.1	5.4	14,000	6.4	2,600	170	0.0165	6.8	940	0.65	0.5	1,400	0.6	33	44
01-VBOU3-SB-0005-C	005	20,000	0.5	1.2	360	0.25	0.25	6.5	4.9	20,000	11	3,900	210	0.0165	6.6	1,000	0.65	0.5	1,100	0.6	42	52
01-VBOU3-SB-0006-A	006	36,000	0.5	11	**1800**	2.5	0.25	14	49	21,000	110	7,400	200	0.26	19	1,400	**4**	0.5	10,000	0.6	64	75
01-VBOU3-SB-0006-B	006	22,000	0.5	**29**	280	0.56	**12**	4.8	**620**	21,000	**170**	3,700	110	**1.3**	25	2,500	0.65	2.5	790	6.4	39	360
01-VBOU3-SB-0006-C	006	28,000	0.5	3.9	69	0.82	**25**	9.3	67	25,000	18	3,800	310	0.0165	**61**	2,200	0.65	0.5	1,300	0.6	37	**520**
01-VBOU3-SB-0007-A	007	4,300	0.5	1.1	48	0.25	0.25	3.9	10	9,900	8.9	1,500	120	0.0165	6.5	1,900	0.65	0.5	250	0.6	21	37
01-VBOU3-SB-0007-B	007	15,000	3.6	**24**	1100	0.64	1.25	17	**330**	**140,000**	**430**	2,500	540	0.0165	**96**	1,200	0.65	1.2	3,600	0.6	26	**500**
01-VBOU3-SB-0007-C	007	11,000	**85**	**2900**	250	0.25	**130**	4.6	**3100**	**120,000**	**1600**	1,800	96	**1.5**	**39**	3,200	**3.5**	**29**	1,100	12	24	**1000**
01-VBOU3-SB-0007-D	007	16,000	0.5	11	140	0.25	**510**	5	**83**	19,000	32	3,100	370	0.046	8.9	2,700	0.65	1.1	880	0.6	30	**3500**
01-VBOU3-SB-0007-E	007	29,000	0.5	4.7	33	1.2	0.25	7.2	23	19,000	17	4,600	250	0.0165	16	2,700	0.65	0.5	1,100	0.6	48	65
01-VBOU3-SB-0008-A	008	14,000	2.1	9.5	790	0.71	**14**	6.8	**280**	16,000	**400**	2,700	260	0.27	**37**	1,300	1.3	2.2	1,500	0.6	24	440
01-VBOU3-SB-0008-B	008	18,000	0.5	**17**	240	0.25	0.25	7.1	**190**	16,000	160	2,900	270	0.26	7	2,300	0.65	3.7	250	0.6	29	81
01-VBOU3-SB-0008-C	008	29,000	0.5	1.3	35	1	0.25	5.1	18	20,000	17	3,700	200	0.0165	8.9	1,800	0.65	0.5	690	0.6	34	48
01-VBOU3-SB-0008-D	008	27,000	0.5	0.5	30	0.82	0.25	6.5	16	20,000	40	3,700	220	0.0165	12	2,200	0.65	0.5	1,500	0.6	38	58
01-VBOU3-SB-0009-A	009	12,000	0.5	10	230	0.25	0.25	6.6	60	16,000	100	3,200	240	0.079	11	2,700	0.65	0.5	250	0.6	32	120
01-VBOU3-SB-0009-B	009	20,000	0.5	9.1	530	0.25	0.25	12	4.5	15,000	11	4,300	250	0.0165	8.7	770	0.65	0.5	1,200	0.6	38	56
01-VBOU3-SB-0009-C	009	30,000	0.5	2	42	1.2	0.25	4.3	22	22,000	18	4,900	500	0.036	9.3	2,300	0.65	0.5	1,600	0.6	54	51
01-VBOU3-SB-0009-D	009	29,000	0.5	6.2	45	1.1	0.25	9.1	18	20,000	17	4,400	190	0.0165	17	3,200	0.65	0.5	1,200	0.6	48	110
01-VBOU3-SB-0010-A	010	25,000	0.5	7.2	660	0.58	**57**	16	12	24,000	12	3,300	470	0.0165	17	1,600	0.65	0.5	1,500	0.6	53	**1200**
01-VBOU3-SB-0010-B	010	21,000	0.5	2.8	30	0.25	0.25	5.9	11	15,000	12	3,600	270	0.0165	11	1,800	0.65	0.5	1,300	0.6	28	48
01-VBOU3-SB-0010-C	010	25,000	0.5	8.7	41	0.77	0.25	17	18	20,000	12	3,900	380	0.0165	15	2,200	0.65	0.5	1,600	0.6	40	58
01-VBOU3-SB-0010-D	010	38,000	0.5	1.3	63	0.76	0.25	5.1	20	27,000	18	4,800	500	0.0165	8	1,800	0.65	0.5	2,500	0.6	39	58
01-VBOU3-SB-0012-A	012	19,000	0.5	8.7	360	0.73	**8.2**	9	**560**	19,000	**360**	3,200	420	0.073	14	2,200	0.65	4.3	250	0.6	34	300
01-VBOU3-SB-0012-B	012	24,000	0.5	4.1	290	0.94	4.4	8.4	**91**	21,000	36	3,900	350	0.0165	12	1,800	0.65	0.5	250	0.6	36	130
01-VBOU3-SB-0013-A	013	20,000	0.5	5.1	210	0.71	6.8	7.5	**82**	18,000	130	3,200	340	0.055	12	1,900	0.65	0.5	250	0.6	34	220
01-VBOU3-SB-0013-B	013	26,000	0.5	1.9	110	0.83	0.25	5.3	16	19,000	14	4,900	350	0.0165	11	2,600	0.65	0.5	1,600	0.6	37	53
01-VBOU3-SB-0014-A	014	22,000	0.5	2	97	0.9	0.25	7.4	17	16,000	13	4,500	400	0.035	14	2,700	0.65	0.5	250	0.6	32	51
01-VBOU3-SB-0014-B	014	29,000	0.5	2.7	120	0.8	0.64	13	14	25,000	11	5,300	560	0.0165	14	1,600	0.65	0.5	1,200	0.6	50	55
01-VBOU3-SB-0014-C	014	27,000	0.5	3.4	160	0.71	0.66	8.8	7.8	28,000	12	4,000	640	0.0165	7.3	1,300	0.65	0.5	1,900	0.6	44	66
01-VBOU3-SB-0015-A	015	12,000	10	3.5	620	0.8	**10**	7.1	**210**	18,000	**280**	2,500	250	0.0165	12	1,800	0.65	0.5	1,500	0.6	28	330
01-VBOU3-SB-0015-B	015	30,000	0.5	2.6	110	0.78	1.4	6.2	**140**	23,000	24	5,500	490	0.0165	22	3,000	0.65	1.1	250	0.6	32	140
01-VBOU3-SB-0015-C	015	29,000	0.5	0.5	39	1	0.25	5.8	19	21,000	18	5,100	440	0.0165	11	2,600	0.65	0.5	540	0.6	43	53
01-VBOU3-SB-0016-A	016	2,000	0.5	1.2	23	0.25	1.1	2.3	**3600**	3,300	5.1	570	190	0.0165	2	150	0.65	0.5	250	0.6	7.5	37
01-VBOU3-SB-0016-B	016	31,000	0.5	**22**	1500	0.25	0.25	12	15	23,000	10	4,100	380	0.0165	7.3	1,400	0.65	0.5	2,700	0.6	45	54
01-VBOU3-SB-0016-D	016	28,000	0.5	1.1	54	0.78	0.25	7.2	20	20,000	15	4,800	320	0.033	13	3,200	0.65	0.5	1,900	0.6	45	66
01-VBOU3-SB-0017-A	017	4,400	0.5	2.5	110	0.25	0.25	3	**83**	4,900	43	550	120	0.13	2	340	0.65	1	250	0.6	11	30
01-VBOU3-SB-0017-B	017	28,000	0.5	2	1200	0.25	0.77	11	4.8	27,000	7.2	7,400	850	0.0165	4.1	790	0.65	0.5	1,300	0.6	56	55
01-VBOU3-SB-0017-C	017	33,000	0.5	5.7	1100	0.74	0.86	22	12	24,000	16	5,700	530	0.0165	10	1,900	0.65	0.5	2,000	0.6	54	58
01-VBOU3-SB-0017-D	017	7,000	0.5	0.5	16	0.25	0.25	1.6	5.8	5,300	3.4	1,300	86	0.0165	2	880	0.65	0.5	250	0.6	11	14
01-VBOU3-SB-0018-A	018	10,000	0.5	2.6	100	0.25	0.25	4.8	**130**	12,000	44	1,800	170	0.0165	6.6	1,900	0.65	0.5	250	0.6	22	36
01-VBOU3-SB-0018-B	018	39,000	0.5	3.6	1200	0.25	1.3	14	9.2	31,000	12	9,300	**1900**	0.0165	6.8	1,000	0.65	0.5	910	0.6	61	55
01-VBOU3-SB-0018-C	018	37,000	0.5	3	1200	0.25	0.69	13	5.2	30,000	7.8	8,800	1000	0.0165	4.7	790	0.65	0.5	1,300	0.6	59	60
01-VBOU3-SB-0019-A	019	23,000	0.5	1.2	44	0.52	0.25	5.7	14	21,000	11	3,700	410	0.033	15	2,500	0.65	0.5	2,200	0.6	34	45
01-VBOU3-SB-0019-B	019	21,000	0.5	1.1	42	0.57	0.25	5.3	18	14,000	22	3,700	440	0.0165	13	2,500	0.65	0.5	2,000	0.6	31	50
01-VBOU3-SB-0020-A	020	33,000	0.5	1.6	340	0.62	0.64	9.8	6.7	27,000	7.3	8,400	890	0.0165	5	720	0.65	0.5	840	0.6	57	56
01-VBOU3-SB-0020-B	020	32,000	0.5	**27**	940	0.91	1.4	**61**	13	38,000	18	5,400	1100	0.0165	**42**	2,100	0.65	0.5	3,300	1.2	59	67
01-VBOU3-SB-0021-A	021	12,000	0.5	**23**	190	0.25	**9.3**	5.3	**270**	14,000	**210**	3,400	340	**1.6**	8	2,400	0.65	3	250	0.6	24	470
01-VBOU3-SB-0021-B	021	25,000	0.5	1.9	45	0.65	0.25	4.4	15	16,000	15	3,700	140	0.0165	8.3	2,100	0.65	0.5	250	0.6	41	40
01-VBOU3-SB-0021-C	021	27,000	0.5	0.5	41	0.59	0.25	3.9	15	19,000	13	3,400	190	0.0165	8.1	2,400	0.65	0.5	250	0.6	36	41

Table F-4. Comparison of Chemicals in Site Soil (by Station) to Background

All soil concentrations are shown as mg/kg.

bold above background

SAMPLE	STATION	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
BACKGROUND [1]		*230,918*	*10.0*	*12.7*	*1797*	*8.7*	*7*	*27.3*	*73.3*	*72,973*	*167.8*	*18,098.9*	*1493.7*	*0.96*	*35*	*67,031*	*1.4*	*5.0*	*31,988*	*12.0*	*142.0*	*497*
01-VBOU3-SB-0022-A	022	5,300	2	**51**	270	0.25	**11**	3.5	**580**	7,800	**380**	4,900	280	0.19	4.7	1,400	0.65	**13**	250	0.6	19	410
01-VBOU3-SB-0022-B	022	24,000	0.5	**15**	1200	0.25	1.8	10	**210**	19,000	140	5,500	570	0.017	6.8	1,500	0.65	2.5	740	0.6	46	110
01-VBOU3-SB-0022-C	022	28,000	0.5	1.5	50	0.79	0.25	6.7	19	19,000	15	5,300	380	0.033	14	3,300	0.65	0.5	650	0.6	48	72
01-VBOU3-SB-0022-D	022	26,000	0.5	**47**	38	1.1	0.25	7.9	34	23,000	16	4,100	110	0.0165	9.4	1,600	0.65	0.5	1,800	0.6	40	110
01-VBOU3-SB-0023-A	023	17,000	0.5	3.5	83	0.25	0.25	5.6	30	17,000	35	3,600	270	0.0165	9.9	2,000	0.65	0.5	520	0.6	30	93
01-VBOU3-SB-0023-B	023	30,000	0.5	3	64	0.95	0.25	7.7	20	23,000	21	3,800	410	0.0165	13	2,500	0.65	0.5	1,300	0.6	45	71
01-VBOU3-SB-0023-C	023	28,000	0.5	5.7	32	1	0.25	6.2	18	21,000	15	3,200	120	0.0165	10	1,700	0.65	0.5	1,100	0.6	34	67
01-VBOU3-SB-0024-A	024	27,000	0.5	**53**	700	0.25	0.65	12	18	28,000	10	4,900	700	0.0165	6.5	1,500	0.65	0.5	2,200	0.6	55	80
01-VBOU3-SB-0024-D	024	32,000	0.5	**13**	1100	0.83	0.65	14	12	27,000	14	4,100	370	0.0165	5.2	1,600	0.65	0.5	5,100	0.6	61	73
01-VBOU3-SB-0025-A	025	32,000	0.5	1.9	740	0.25	0.7	12	4.7	34,000	7.6	8,300	820	0.0165	4	720	0.65	0.5	3,300	0.6	66	76
01-VBOU3-SB-0025-B	025	27,000	0.5	2	160	0.25	0.25	13	3.2	32,000	6.5	7,300	**3600**	0.0165	4.9	500	0.65	0.5	1,700	0.6	66	68
01-VBOU3-SB-0026-A	026	9,100	0.5	3.4	79	0.25	0.67	5.8	23	14,000	23	3,100	220	0.0165	16	1,800	0.65	0.5	250	0.6	33	69
01-VBOU3-SB-0026-B	026	25,000	0.5	4.1	110	1	0.25	7.1	19	24,000	50	3,700	520	0.039	9.1	2,100	0.65	0.5	790	0.6	35	87
01-VBOU3-SB-0027-A	027	24,000	0.5	4.4	120	0.25	0.25	7.6	20	21,000	19	3,400	300	0.0165	10	3,200	0.65	0.5	660	0.6	41	62
01-VBOU3-SB-0027-B	027	28,000	0.5	10	280	0.75	0.25	12	66	27,000	40	4,800	650	0.077	13	2,300	0.65	1.1	1,000	0.6	51	130
01-VBOU3-SB-0027-C	027	36,000	0.5	2.9	1100	0.76	0.25	10	12	29,000	9.2	5,500	420	0.0165	4.5	1,800	0.65	0.5	1,800	0.6	60	64
01-VBOU3-SB-0027-D	027	30,000	0.5	10	1100	0.75	0.25	14	15	27,000	11	4,100	380	0.0165	5.9	1,900	0.65	0.5	2,800	0.6	73	67
01-VBOU3-SB-0027-E	027	29,000	0.5	1.9	84	0.84	0.25	5.2	24	21,000	16	4,500	630	0.0165	16	3,800	0.65	0.5	1,100	0.6	50	63
01-VBOU3-SB-0028-A	028	30,000	0.5	2.4	36	0.76	0.25	5.1	11	21,000	12	4,400	320	0.0165	8.4	2,000	0.65	0.5	1,800	0.6	37	49
01-VBOU3-SB-0028-B	028	25,000	0.5	4.9	210	0.25	0.25	11	7.5	33,000	9.1	3,800	490	0.0165	9.8	1,300	0.65	0.5	1,700	0.6	57	65
01-VBOU3-SB-0028-C	028	27,000	0.5	5.3	32	1.1	0.25	4.5	22	16,000	19	3,300	97	0.039	9.3	2,300	0.65	0.5	1,500	0.6	37	65
01-VBOU3-SB-0028-D	028	27,000	0.5	1.9	38	0.7	0.25	5.6	17	17,000	16	4,000	110	0.0165	13	3,000	0.65	0.5	1,300	0.6	47	58
01-VBOU3-SB-0028-E	028	31,000	0.5	2.3	30	0.6	0.25	4.3	20	19,000	11	3,100	120	0.39	8.8	2,400	0.65	0.5	1,500	0.6	42	52
01-VBOU3-SB-0029-A	029	38,000	0.5	0.5	49	1	0.25	11	11	31,000	15	4,600	290	0.0165	15	2,300	0.65	0.5	1,700	0.6	42	68
01-VBOU3-SB-0029-B	029	32,000	0.5	0.5	35	0.75	0.25	7.2	22	25,000	14	3,900	220	0.0165	15	2,500	0.65	0.5	1,400	0.6	44	57
01-VBOU3-SB-0029-C	029	31,000	0.5	0.5	35	1.1	0.25	5.9	19	21,000	21	3,300	240	0.0165	12	2,100	0.65	0.5	1,500	0.6	49	55
01-VBOU3-SB-0029-D	029	28,000	0.5	1.1	29	0.53	0.25	6	12	20,000	13	3,100	200	0.0165	11	2,000	0.65	0.5	1,300	0.6	32	50
01-VBOU3-SB-0029-E	029	26,000	0.5	1.5	41	0.57	0.25	8.5	24	20,000	27	3,600	430	0.081	21	2,800	0.65	0.5	1,200	0.6	45	77
01-VBOU3-SB-0030-A	030	23,000	0.5	2.8	86	0.65	0.25	6.3	65	18,000	22	3,900	260	0.0165	10	2,400	0.65	0.5	720	0.6	34	55
01-VBOU3-SB-0030-B	030	33,000	0.5	1.3	51	0.85	0.25	12	13	23,000	15	5,600	370	0.0165	15	3,200	0.65	0.5	2,900	0.6	58	53
01-VBOU3-SB-0030-C	030	21,000	0.5	3.1	1200	0.25	0.25	6.6	4	10,000	6.4	2,000	190	0.0165	5.9	1,300	0.65	0.5	5,500	0.6	29	37
01-VBOU3-SB-0031-A	031	33,000	0.5	1.2	64	1.1	0.78	6.7	26	25,000	17	5,100	310	0.0165	9.8	2,600	0.65	0.5	2,300	0.6	45	56
01-VBOU3-SB-0031-B	031	31,000	0.5	0.5	33	1.1	0.57	5.5	15	21,000	14	4,100	280	0.0165	8.8	1,700	0.65	0.5	2,300	0.6	35	39
01-VBOU3-SB-0031-C	031	35,000	0.5	0.5	25	1	0.74	6.4	12	26,000	10	4,100	270	0.0165	12	2,400	0.65	0.5	2,100	0.6	44	53
01-VBOU3-SB-0032-A	032	25,000	0.5	**13**	210	0.55	1.1	7.6	**150**	19,000	110	4,100	330	0.069	11	2,600	0.65	1.4	1,100	0.6	44	130
01-VBOU3-SB-0032-B	032	22,000	0.5	7.7	280	0.25	0.25	6.7	45	32,000	**230**	4,100	320	0.24	15	2,700	0.65	0.5	1,800	0.6	42	130
01-VBOU3-SB-0032-C	032	32,000	0.5	1	49	0.78	0.25	7.5	24	22,000	21	4,500	240	0.0165	12	3,000	0.65	0.5	1,800	0.6	54	58
01-VBOU3-SB-0032-D	032	45,000	0.5	0.5	51	1	0.25	7.3	17	32,000	24	4,700	370	0.046	13	2,500	0.65	0.5	2,100	0.6	50	77
01-VBOU3-SB-0032-E	032	31,000	0.5	3.5	37	1	0.25	6.5	18	22,000	18	4,100	150	0.0165	14	3,000	0.65	0.5	1,800	0.6	45	75
01-VBOU3-SB-0033-A	033	20,000	0.5	5.5	200	0.51	0.25	7.5	18	17,000	21	3,500	240	0.0165	8.5	1,900	0.65	0.5	530	0.6	32	65
01-VBOU3-SB-0033-B	033	13,000	0.5	2.9	100	0.25	0.55	6.4	8.1	17,000	12	3,100	300	0.0165	8.6	2,800	0.65	0.5	250	0.6	31	55
01-VBOU3-SB-0033-C	033	5,100	0.5	1.8	55	0.25	0.25	4	6	12,000	9.3	1,700	160	0.0165	5.8	1,200	0.65	0.5	250	0.6	23	33
01-VBOU3-SB-0033-D	033	1,400	0.5	0.5	11	0.25	0.88	0.5	7.5	3,300	0.4	330	30	0.0165	2	150	0.65	0.5	250	0.6	4.6	25
01-VBOU3-SB-0033-E	033	23,000	0.5	6.7	36	0.94	0.25	18	14	17,000	18	3,700	160	0.0165	21	1,900	0.65	0.5	720	0.6	29	67
01-VBOU3-SB-0034-A	034	23,000	0.5	8.8	430	0.59	0.25	21	12	18,000	19	3,800	770	0.0165	15	1,300	0.65	0.5	1,000	1.2	40	62
01-VBOU3-SB-0034-B	034	25,000	0.5	9.2	250	0.65	0.25	8.4	8.3	20,000	12	4,500	270	0.0165	7	1,300	0.65	0.5	2,000	0.6	55	58
01-VBOU3-SB-0034-C	034	8,000	0.5	2.6	73	0.25	0.25	6	7.3	16,000	12	2,400	250	0.0165	8.2	2,100	0.65	0.5	250	0.6	27	41
01-VBOU3-SB-0034-E	034	8,400	0.5	1.2	670	0.25	0.25	2.7	4.1	7,900	4.1	1,300	92	0.0165	2	1,000	0.65	0.5	840	0.6	16	22
01-VBOU3-SB-0034-F	034	28,000	0.5	4.8	51	0.88	0.25	7.5	12	24,000	12	4,400	340	0.0165	9.1	1,700	0.65	0.5	910	0.6	29	71
01-VBOU3-SB-0035-A	035	8,300	0.5	2.6	86	0.25	0.25	4.8	9	11,000	11	1,900	190	0.0165	6.4	2,200	0.65	0.5	250	0.6	22	70
01-VBOU3-SB-0035-B	035	3,300	0.5	1	36	0.25	0.91	2.2	2.8	5,400	3.3	760	150	0.0165	4.9	860	0.65	0.5	250	0.6	8.9	55
01-VBOU3-SB-0035-C	035	18,000	0.5	1.3	23	0.54	0.25	3.7	11	13,000	20	2,500	200	0.0165	7.2	1,200	0.65	0.5	250	0.6	25	73
01-VBOU3-SB-0036-A	036	15,000	0.5	5.7	130	0.56	0.25	5.8	24	15,000	21	2,700	240	0.0165	8.1	2,700	0.65	0.5	250	0.6	30	69
01-VBOU3-SB-0036-B	036	13,000	0.5	2.5	97	0.25	**10**	5.6	10	14,000	13	2,400	290	0.0165	8.8	2,000	0.65	0.5	250	0.6	26	350
01-VBOU3-SB-0036-C	036	24,000	0.5	1.2	33	0.85	0.25	2.4	26	17,000	19	3,300	240	0.066	7.1	2,000	0.65	0.5	250	0.6	30	50
01-VBOU3-SB-0037-A	037	17,000	0.5	6.1	160	0.9	2.7	6.8	23	18,000	30	3,300	410	0.0165	9.2	2,600	0.65	0.5	250	0.6	31	130
01-VBOU3-SB-0037-B	037	23,000	0.5	2.6	56	0.86	0.59	6	21	18,000	16	4,400	150	0.1	16	2,200	0.65	0.5	960	0.6	34	100
01-VBOU3-SB-0037-C	037	22,000	0.5	2.9	19	0.53	0.25	4.6	4.3	15,000	12	2,600	160	0.0165	7	910	0.65	0.5	720	0.6	24	41

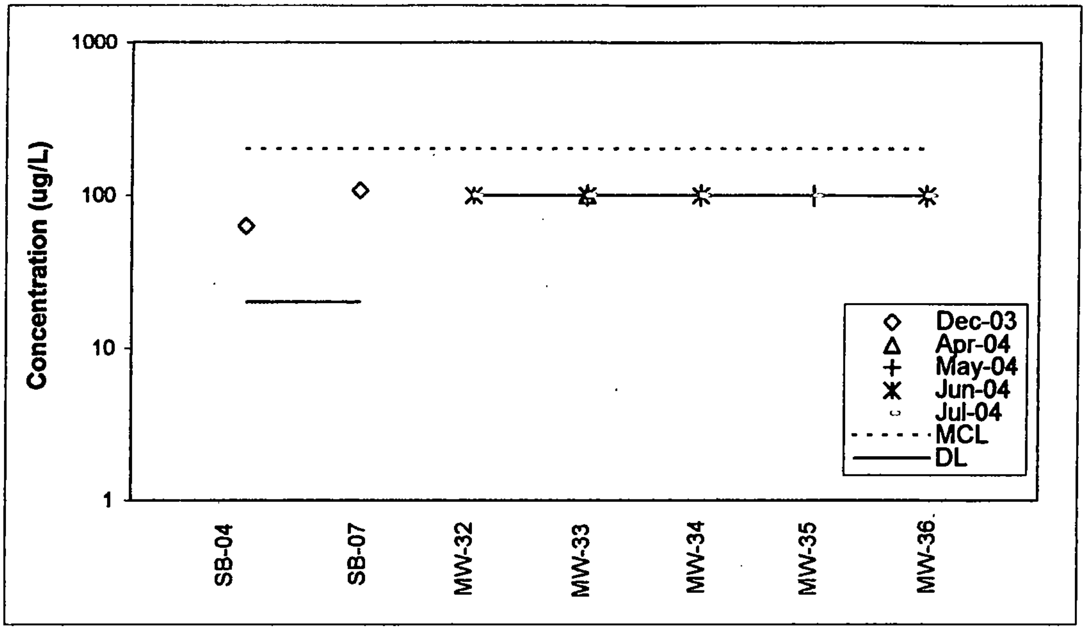
[1] For most chemicals, background is equal to the value at the 99th percentile of the distribution of the background concentration for a chemical, based on soil samples collected from 7 counties surrounding the Denver Metro Area (Shacklette and Boerngen, 1983). Background concentrations for antimony, cadmium, silver and thallium were not availabe in Shacklette and Boerngen (or the data set was too small to estimate the 99th percentile from), thus background for these chemicals is based on the upper end of the range of background concentrations reported for a chemical in soils in the United States in Dragun, 1988.

APPENDIX G

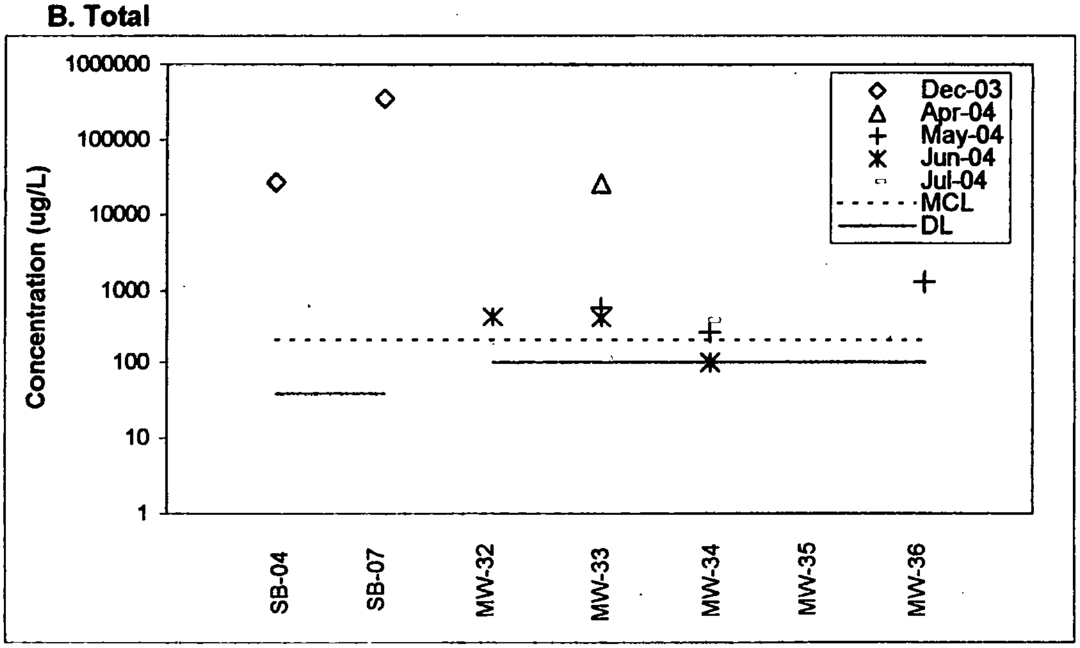
NATURE AND EXTENT OF ON-SITE GROUNDWATER CONTAMINATION

Figure G-1. Spatial and Temporal Distribution of Aluminum in Groundwater

A. Dissolved



B. Total



Note: concentrations are plotted on a log scale

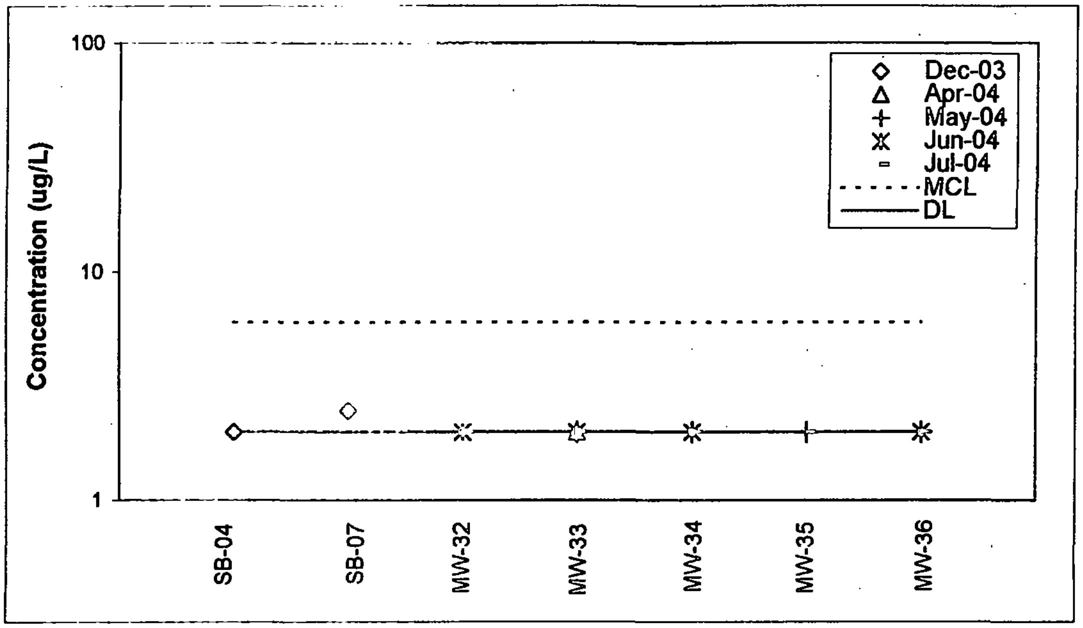
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

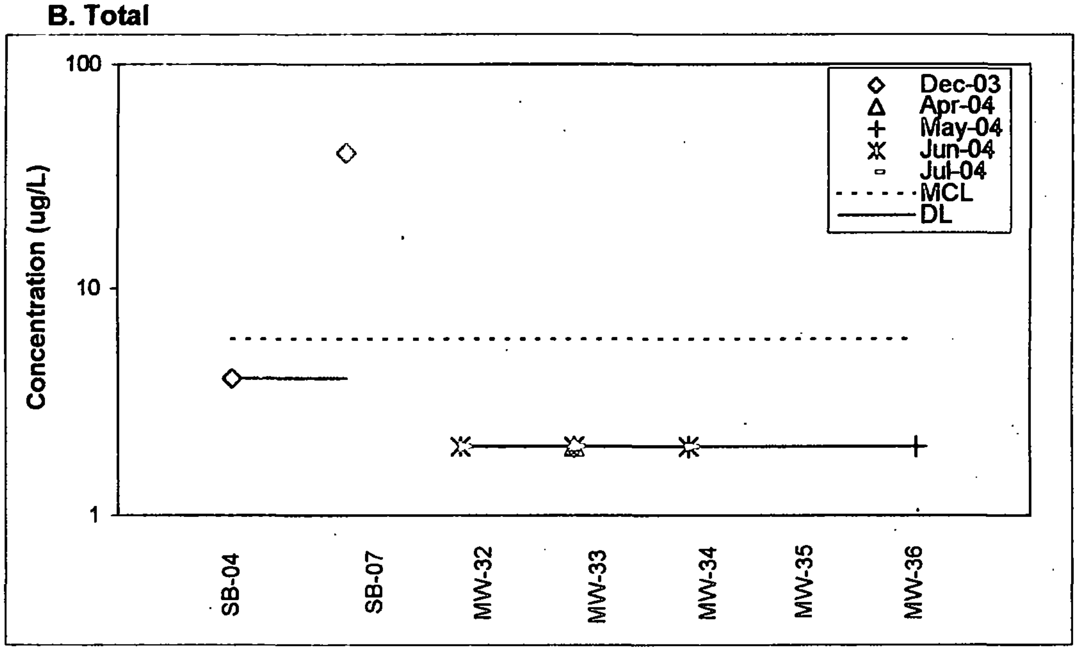
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-2. Spatial and Temporal Distribution of Antimony in Groundwater

A. Dissolved



B. Total



Note: concentrations are plotted on a log scale

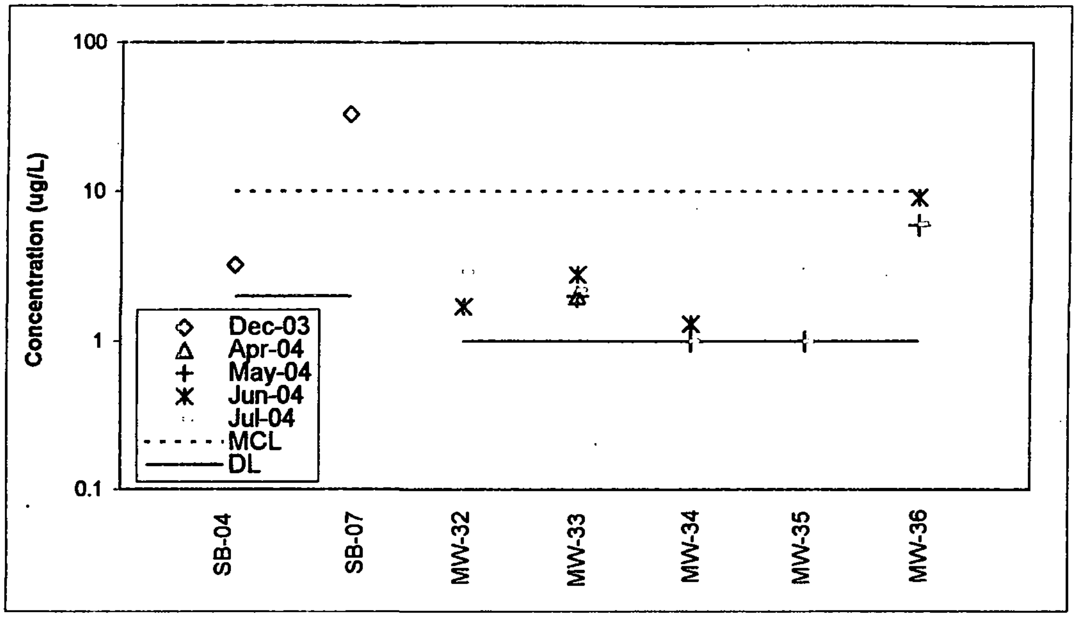
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

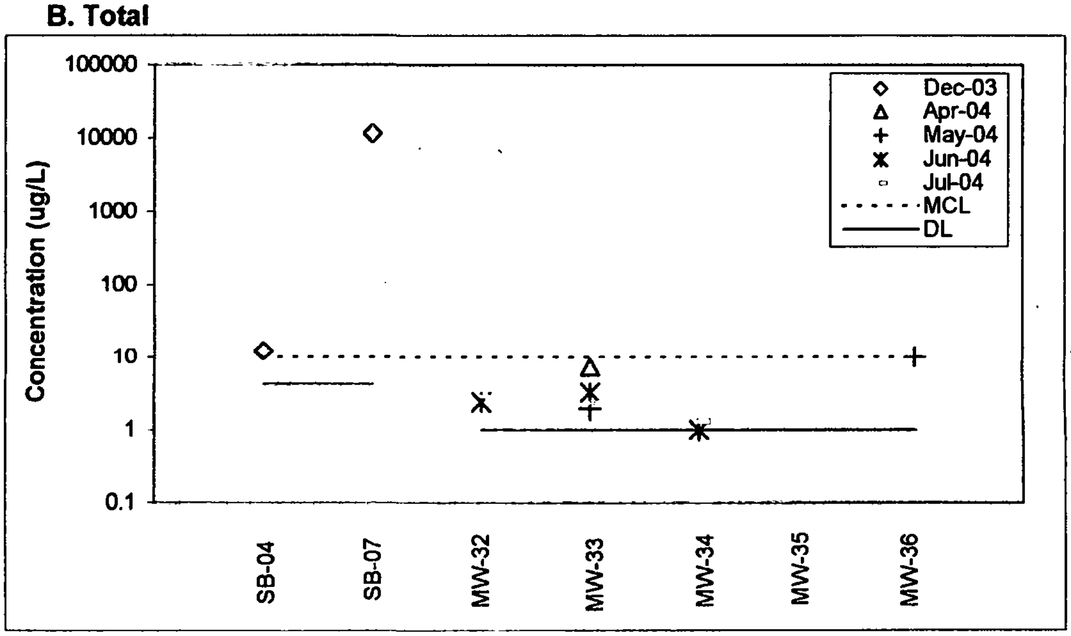
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-3. Spatial and Temporal Distribution of Arsenic in Groundwater

A. Dissolved



B. Total



Note: concentrations are plotted on a log scale

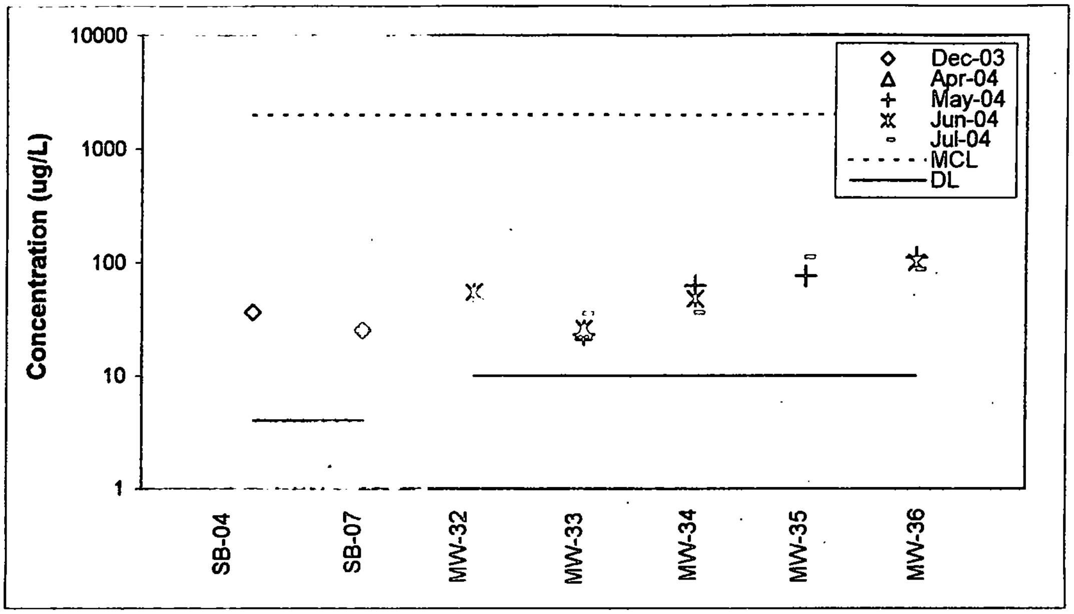
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

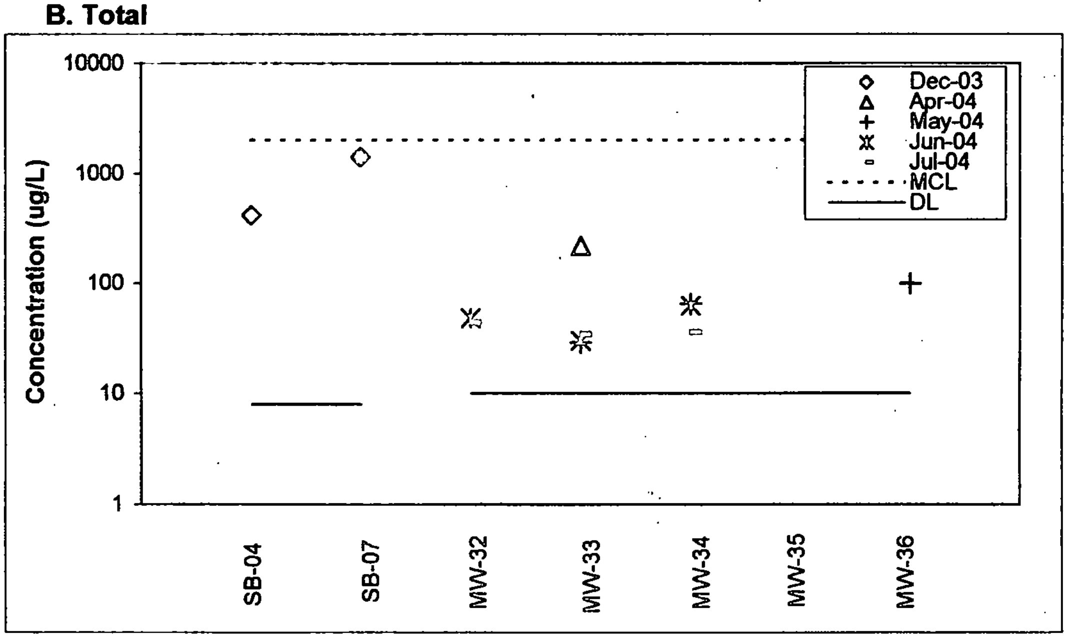
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-4. Spatial and Temporal Distribution of Barium in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

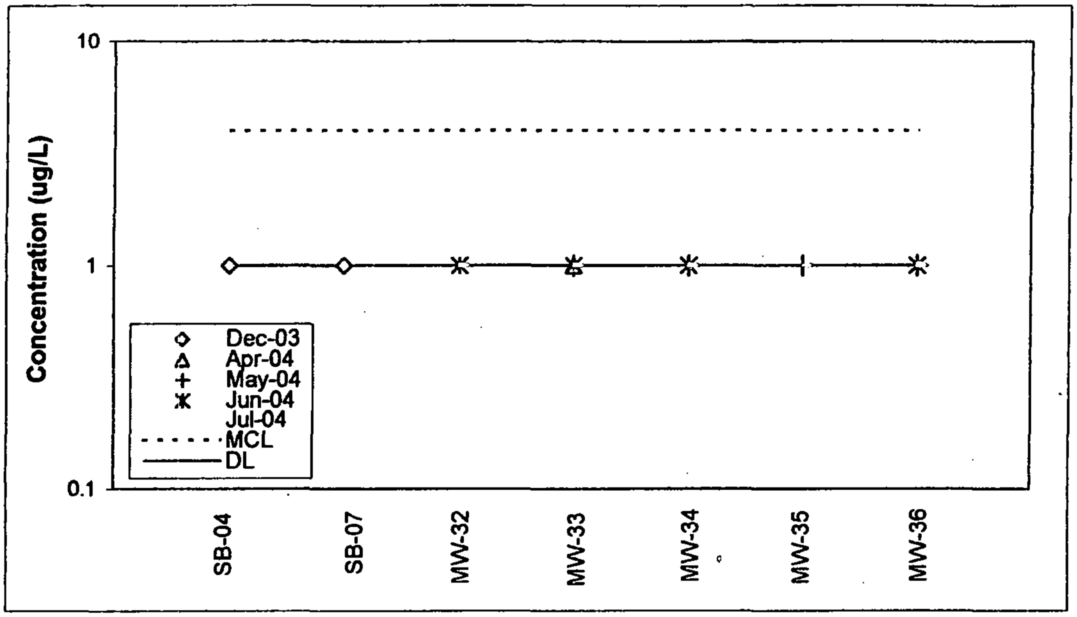
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

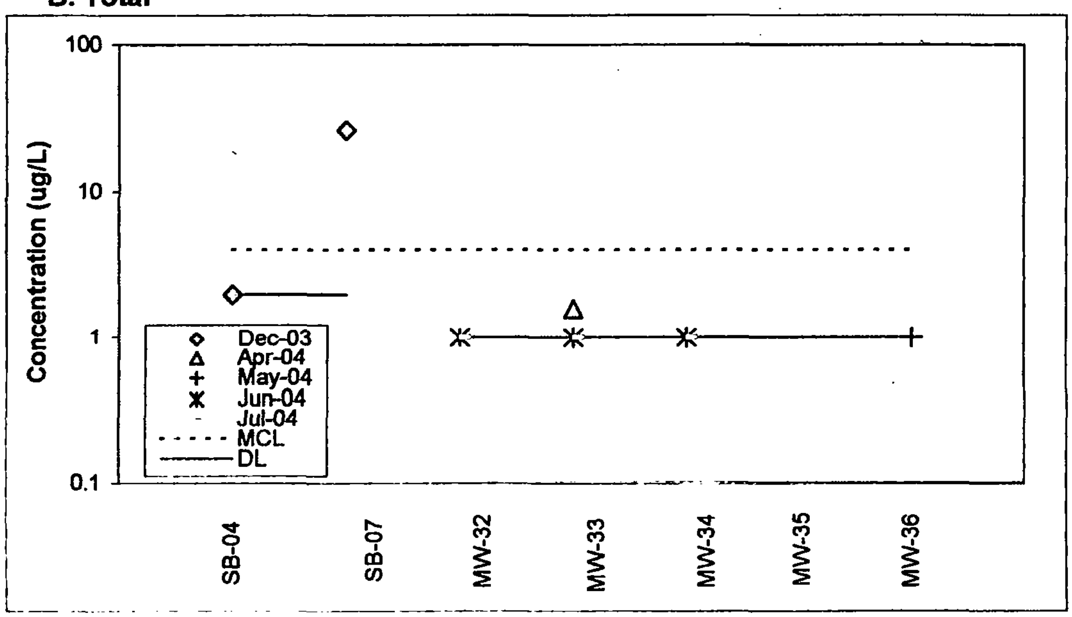
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-5. Spatial and Temporal Distribution of Beryllium in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

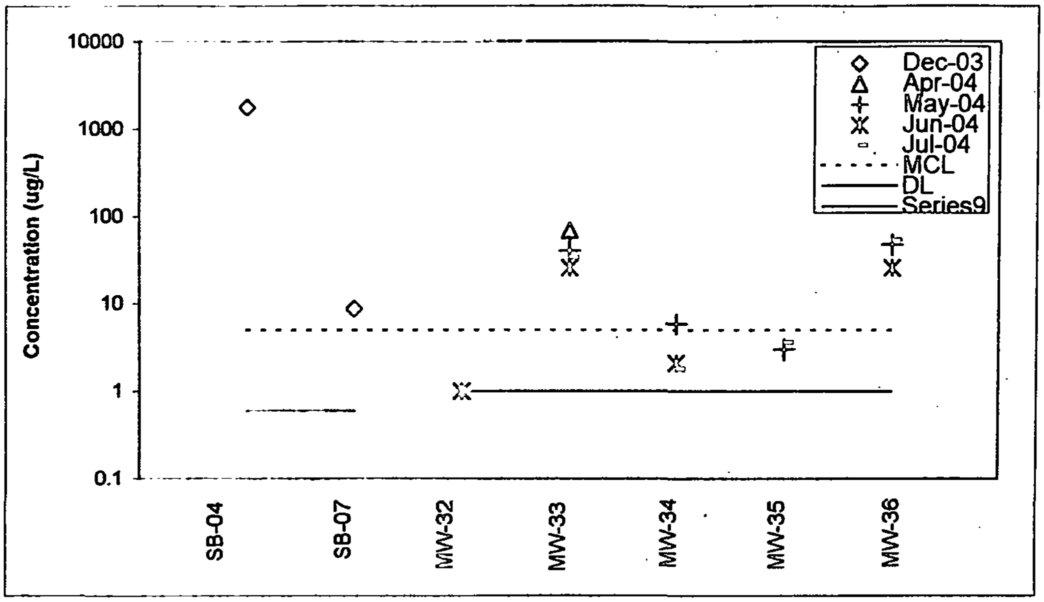
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

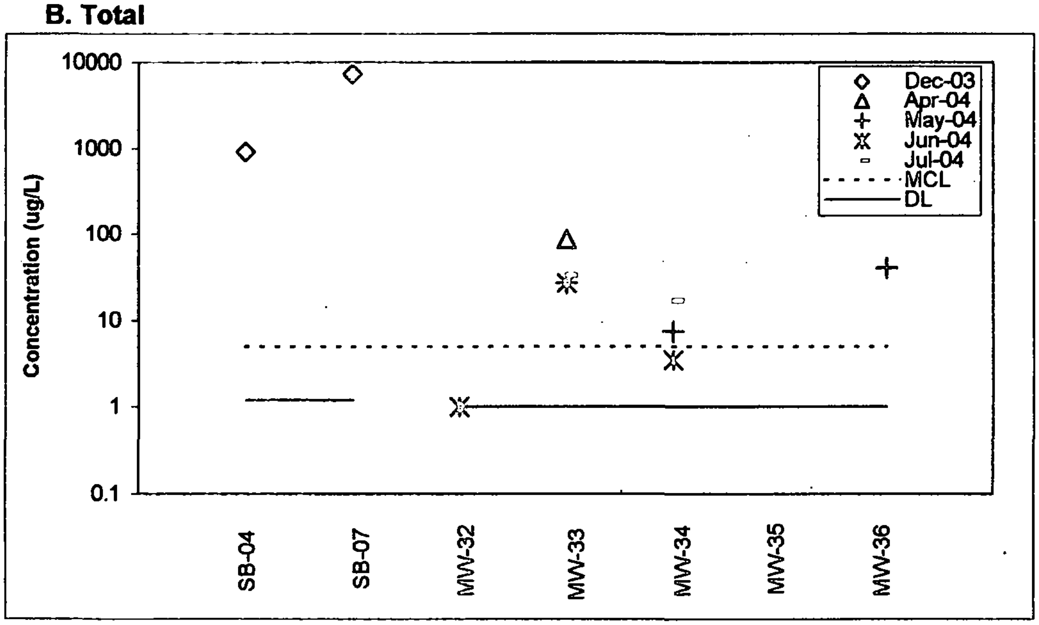
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-6. Spatial and Temporal Distribution of Cadmium in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

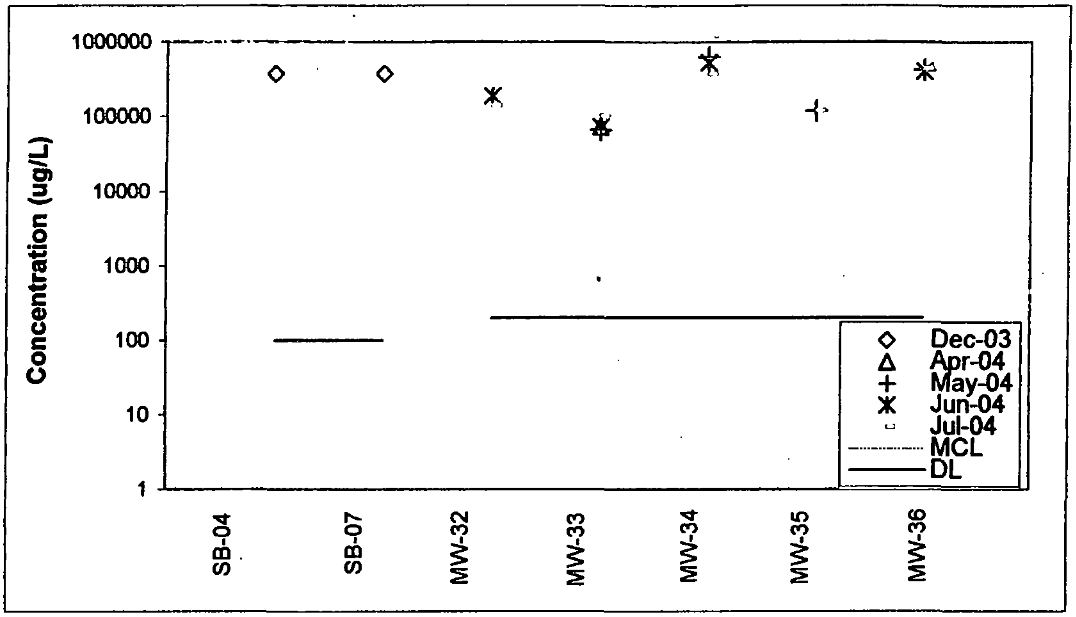
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

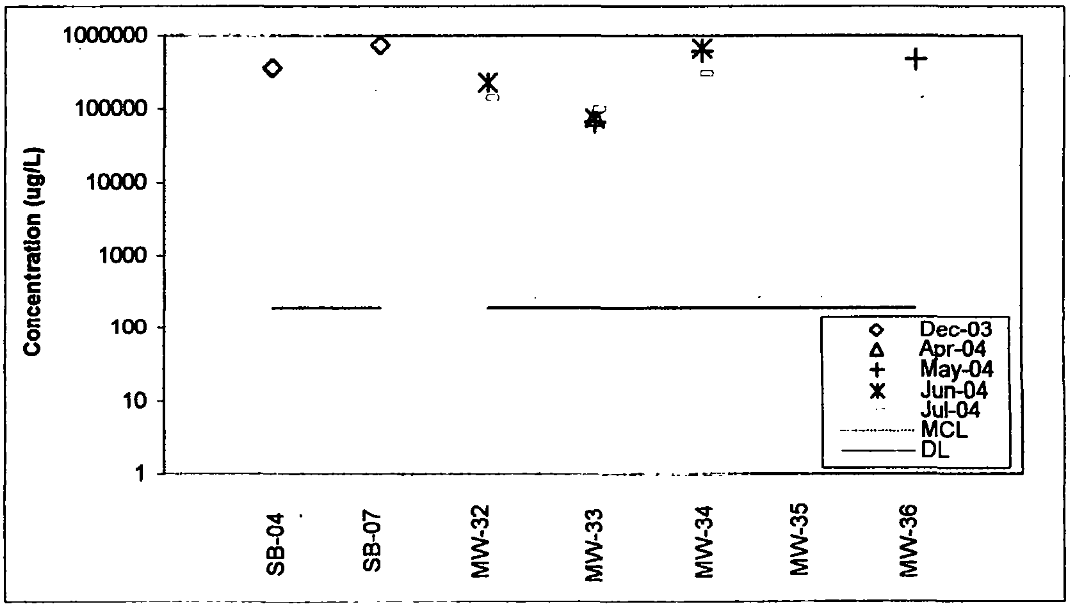
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-7. Spatial and Temporal Distribution of Calcium in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

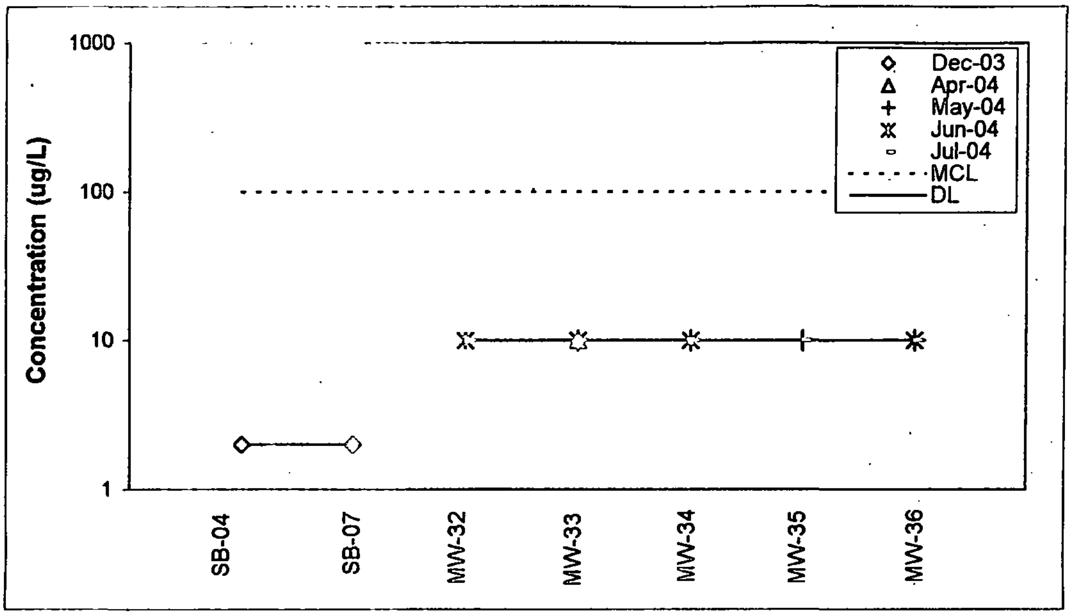
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

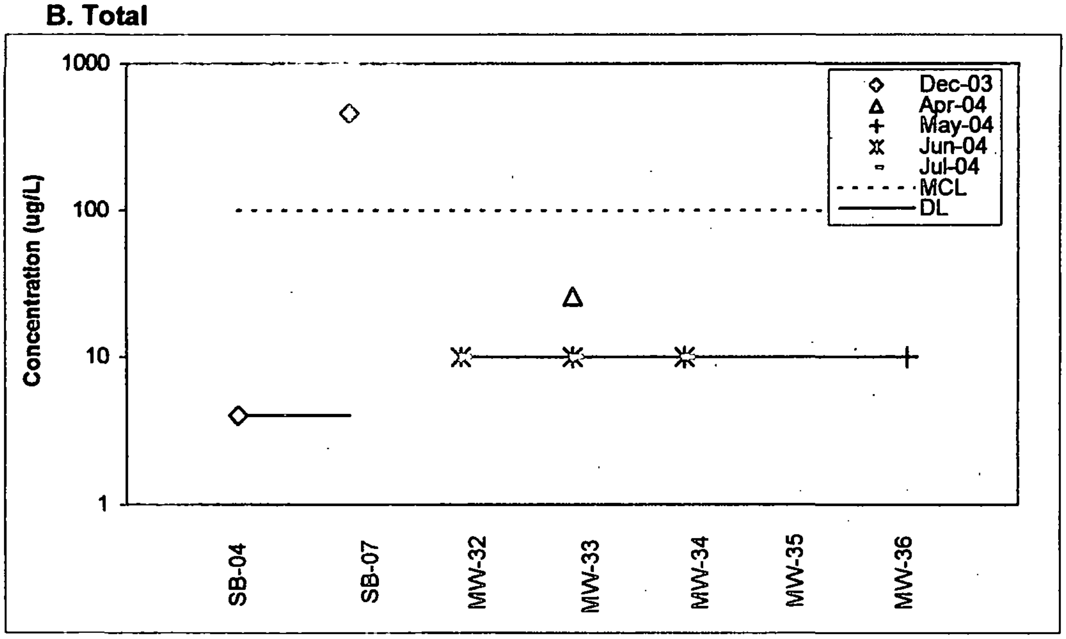
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-8. Spatial and Temporal Distribution of Chromium in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

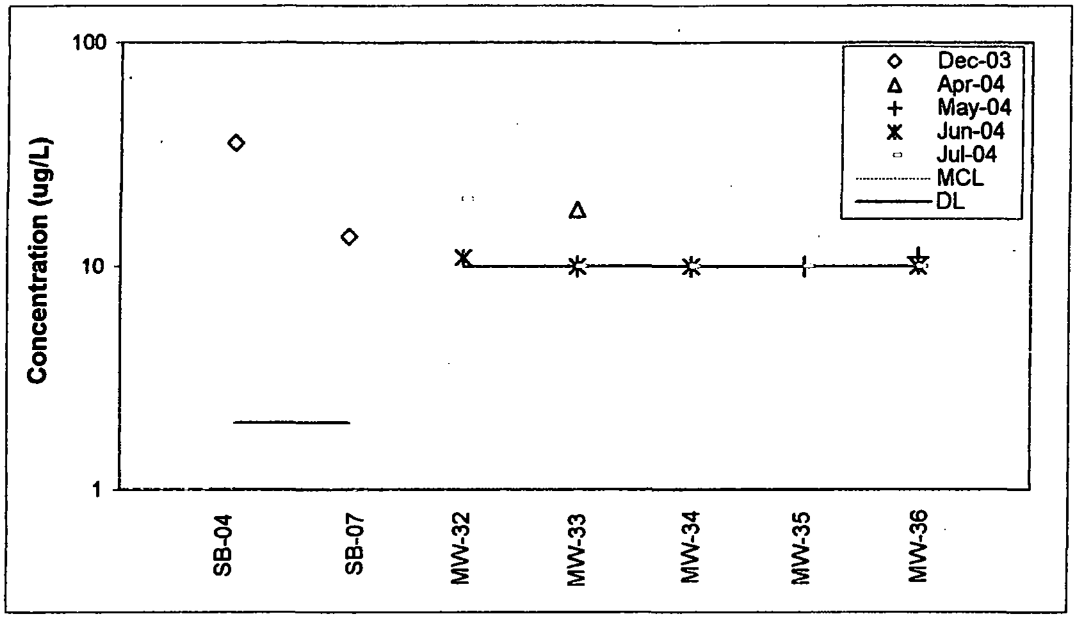
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

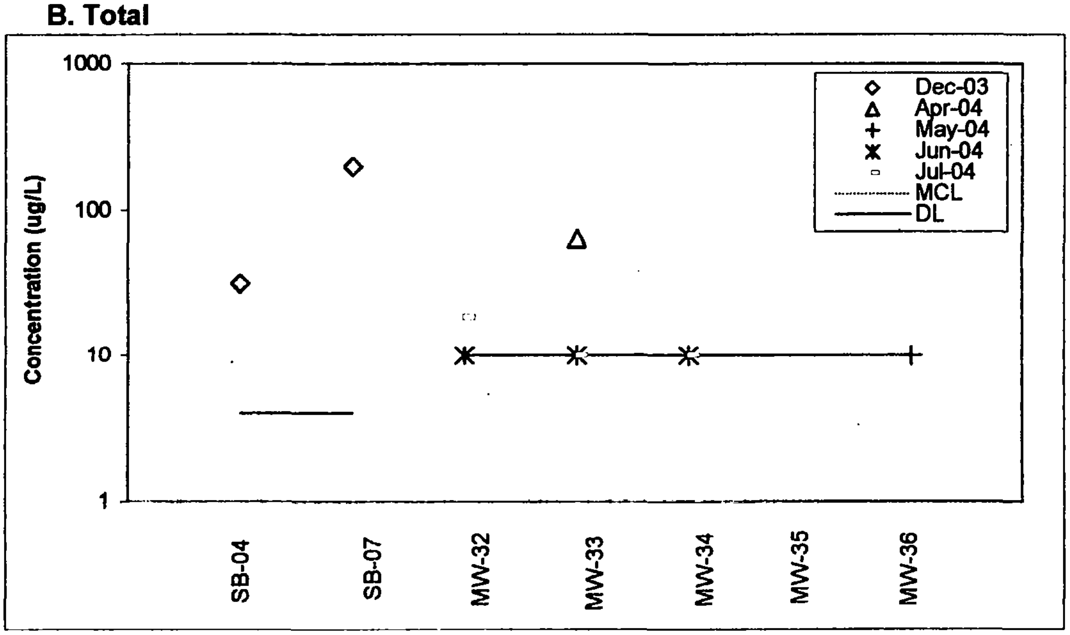
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-9. Spatial and Temporal Distribution of Cobalt in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

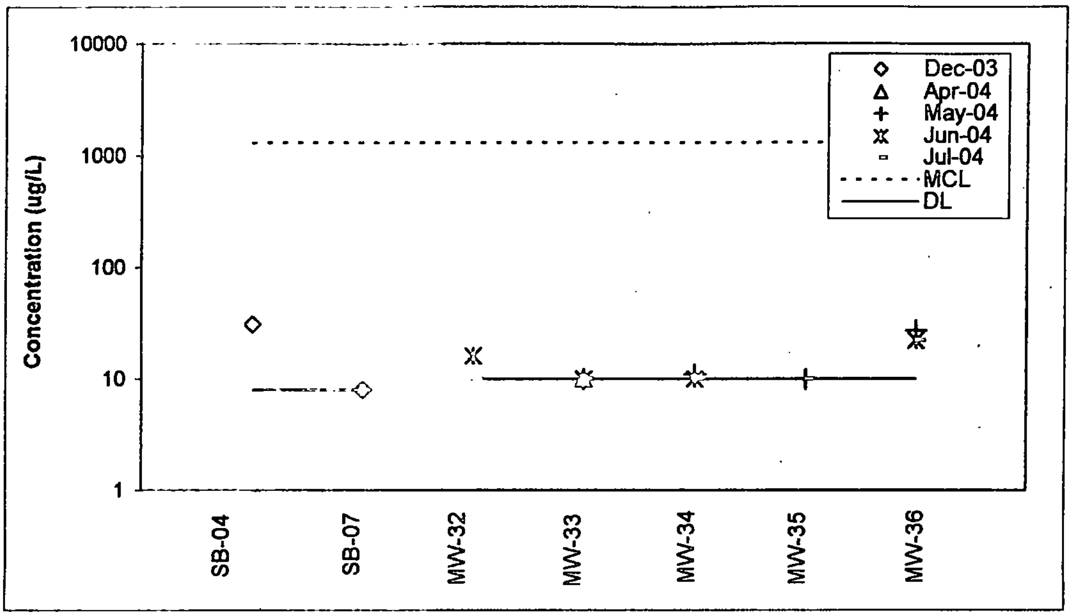
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

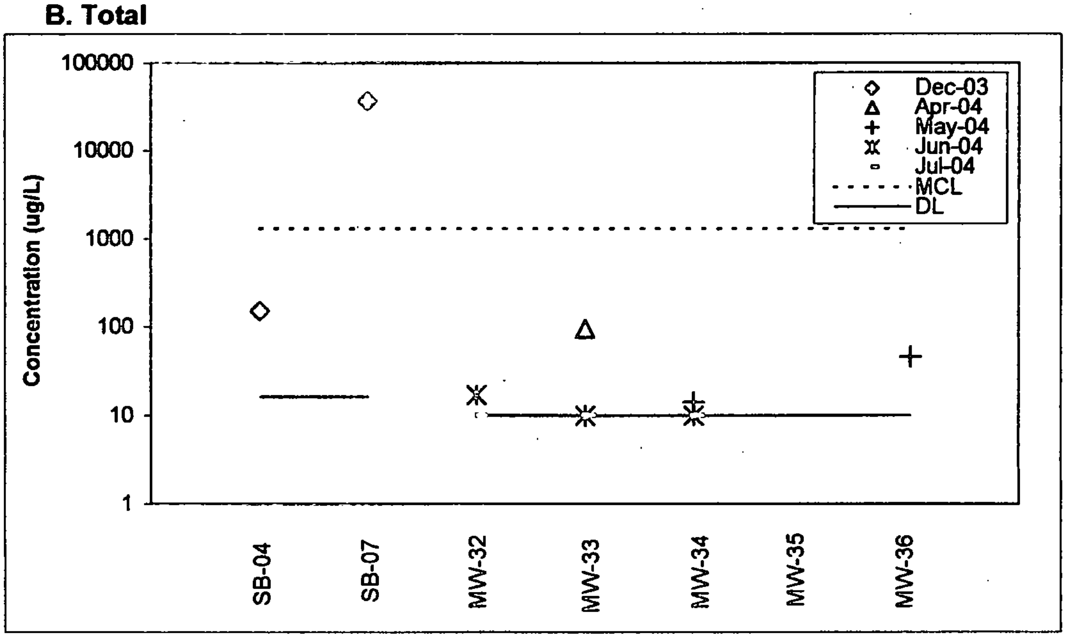
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-10. Spatial and Temporal Distribution of Copper in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

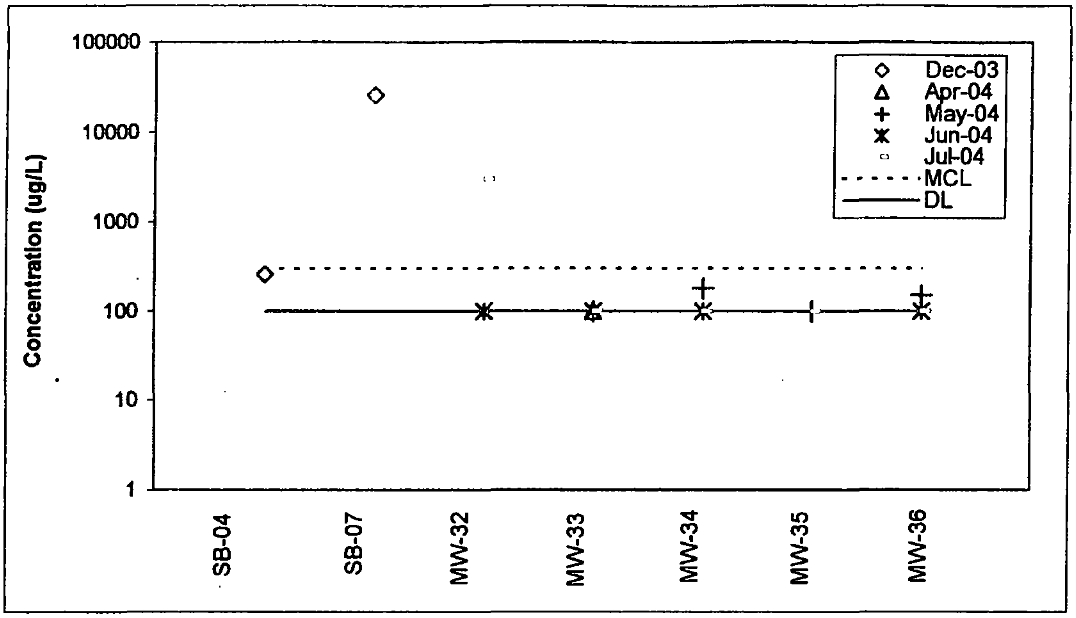
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

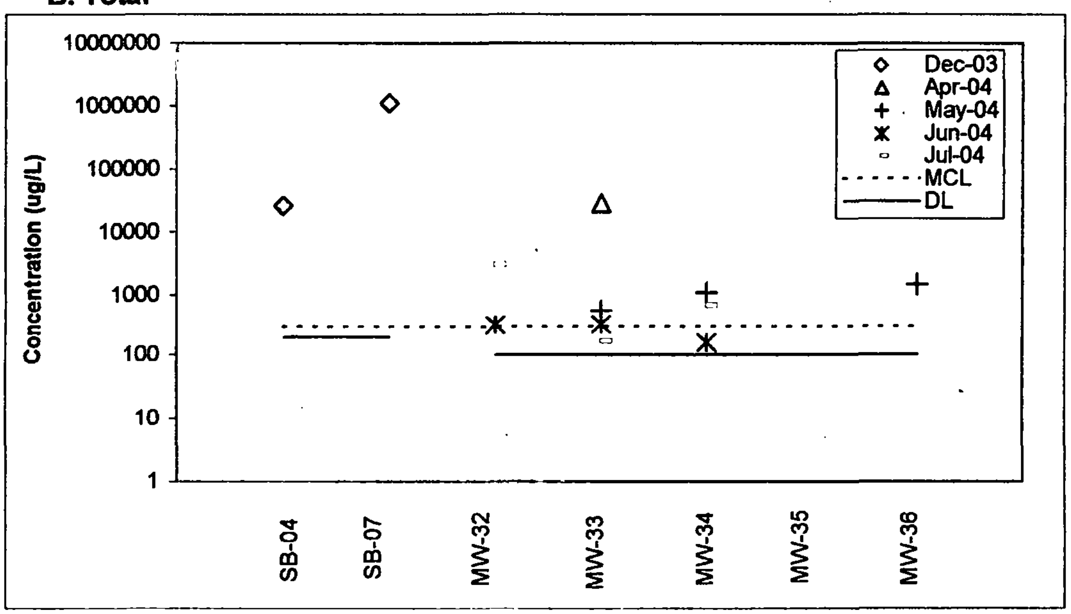
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-11. Spatial and Temporal Distribution of Iron in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

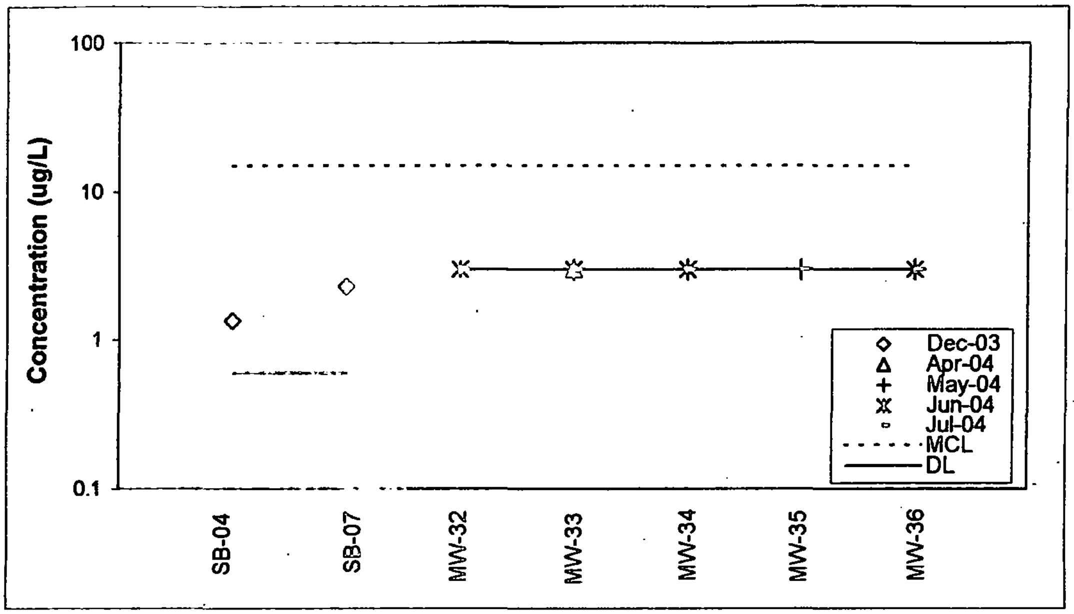
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

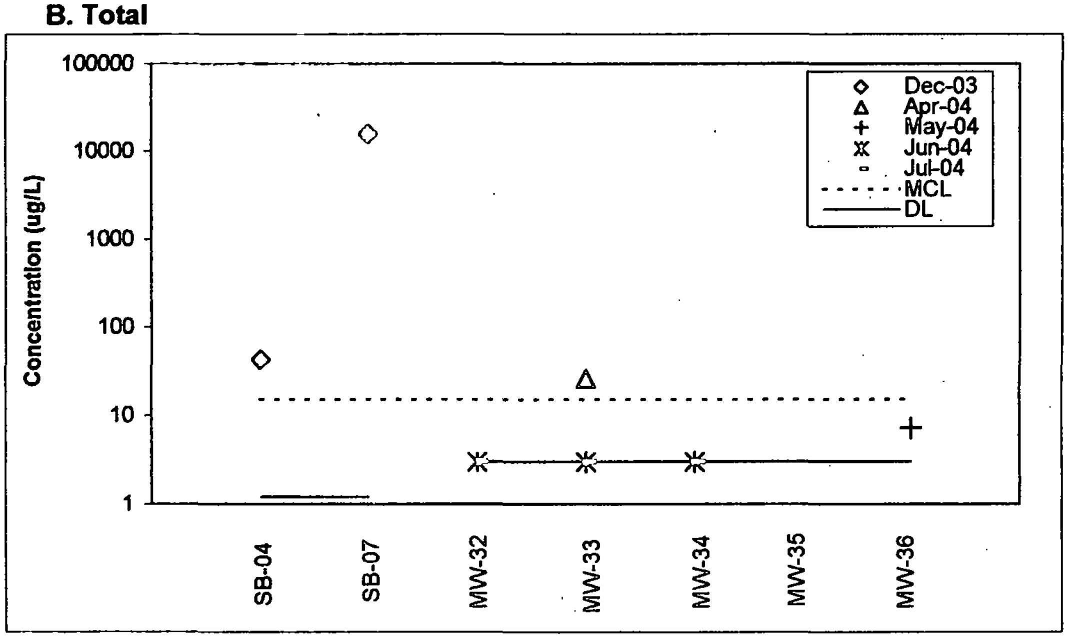
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-12. Spatial and Temporal Distribution of Lead in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

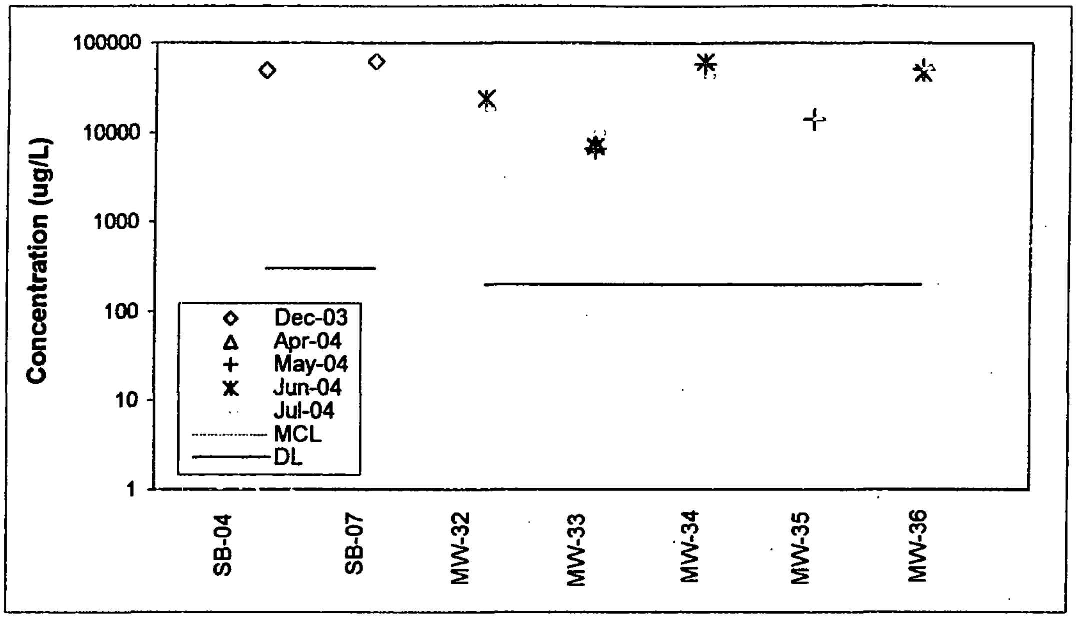
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

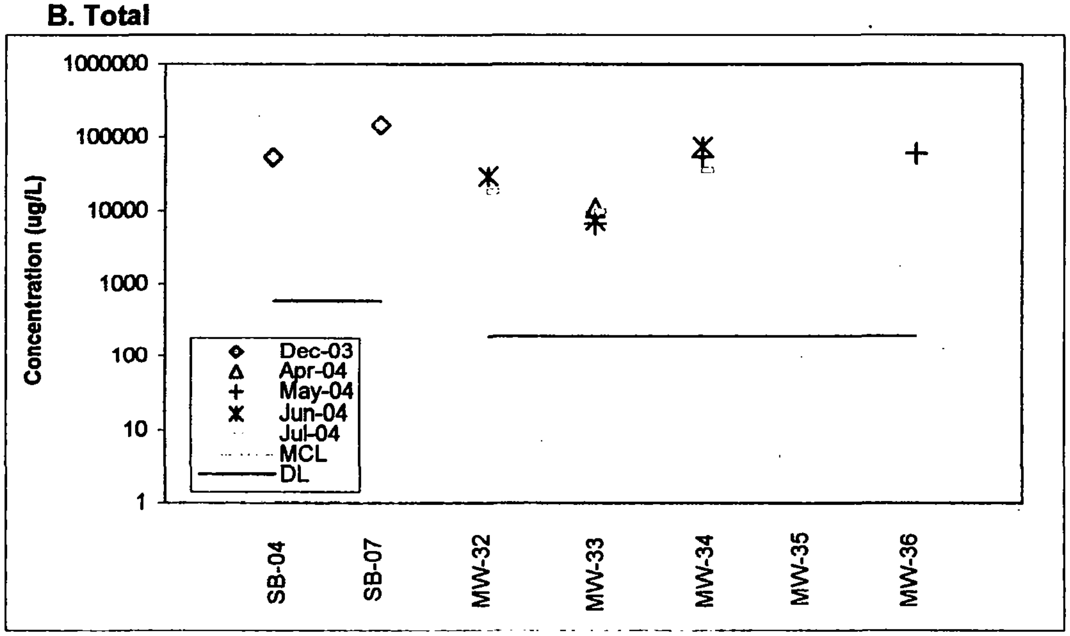
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-13. Spatial and Temporal Distribution of Magnesium in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

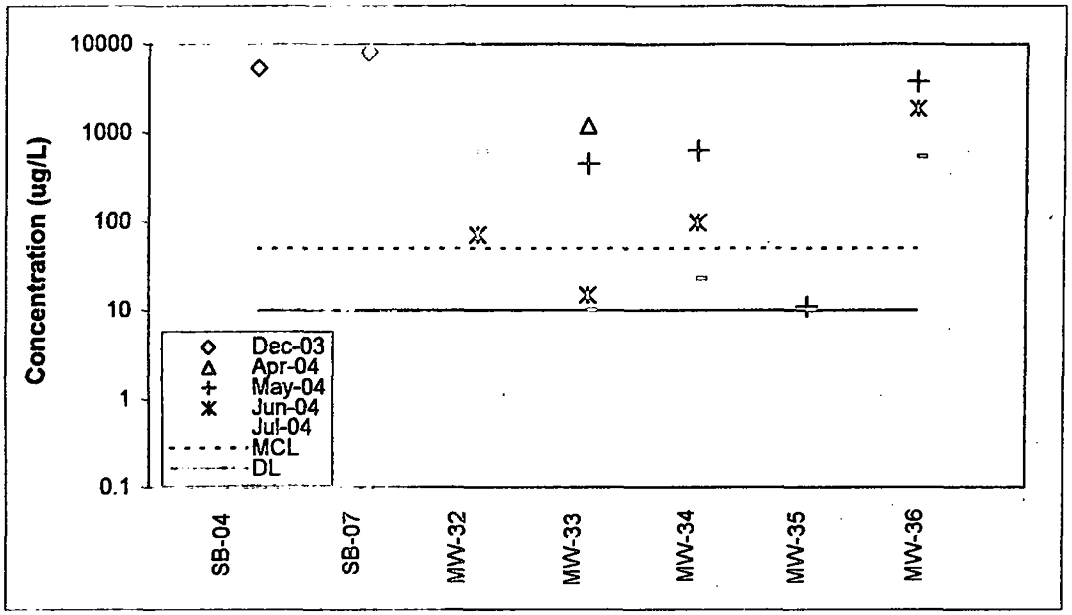
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

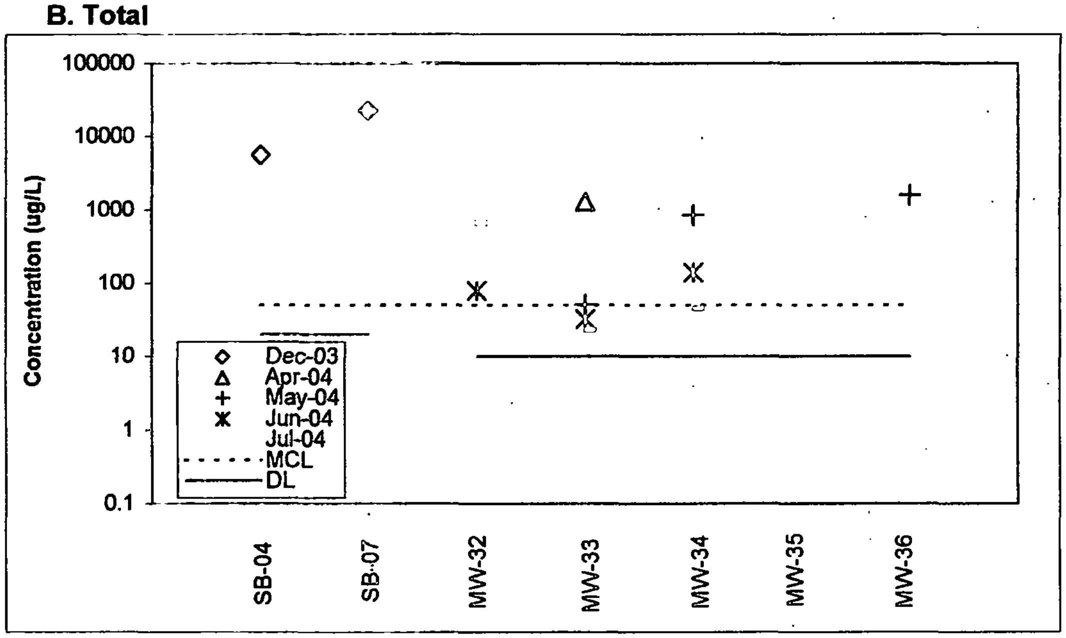
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-14. Spatial and Temporal Distribution of Manganese in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

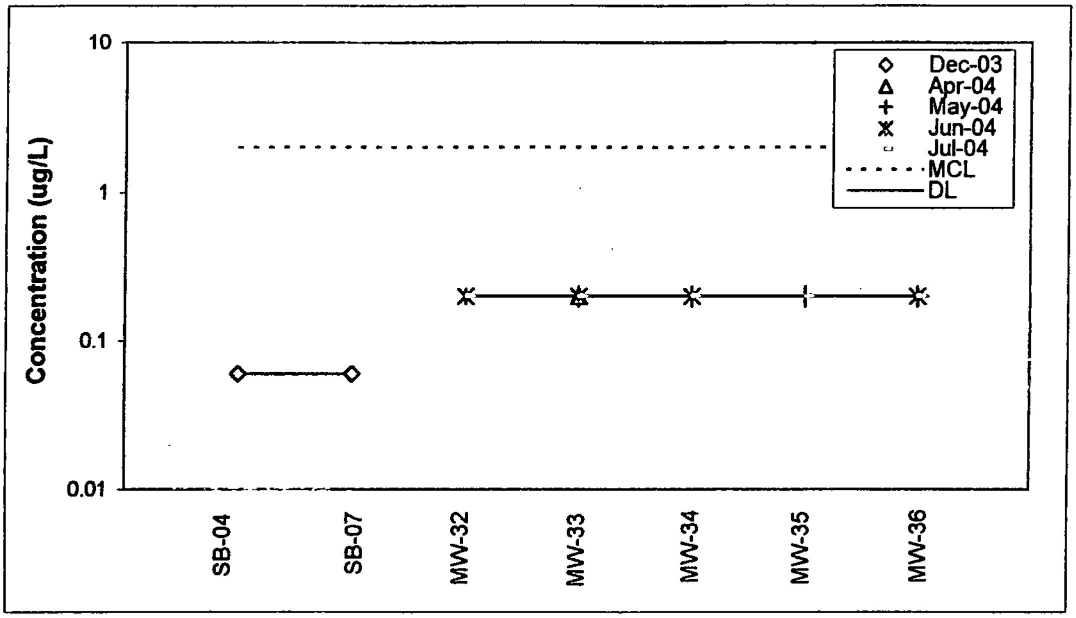
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

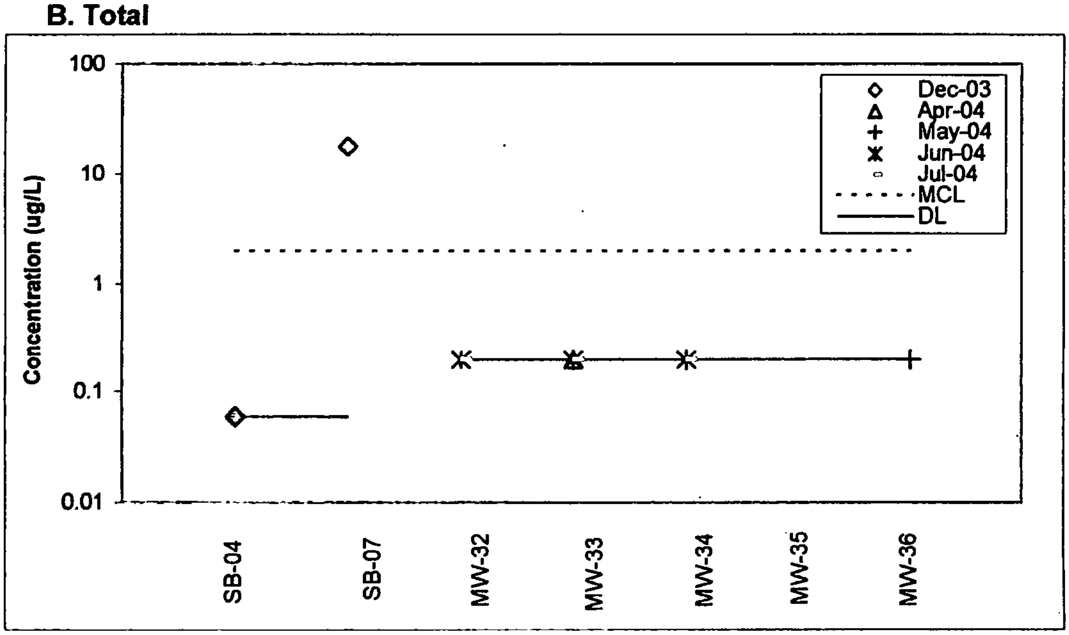
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-15. Spatial and Temporal Distribution of Mercury in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

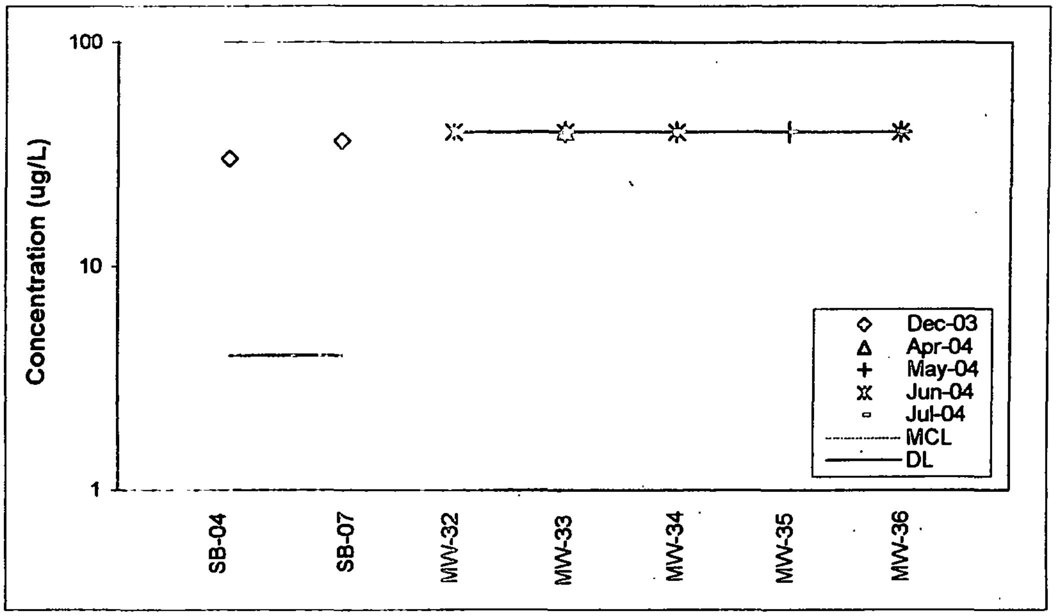
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

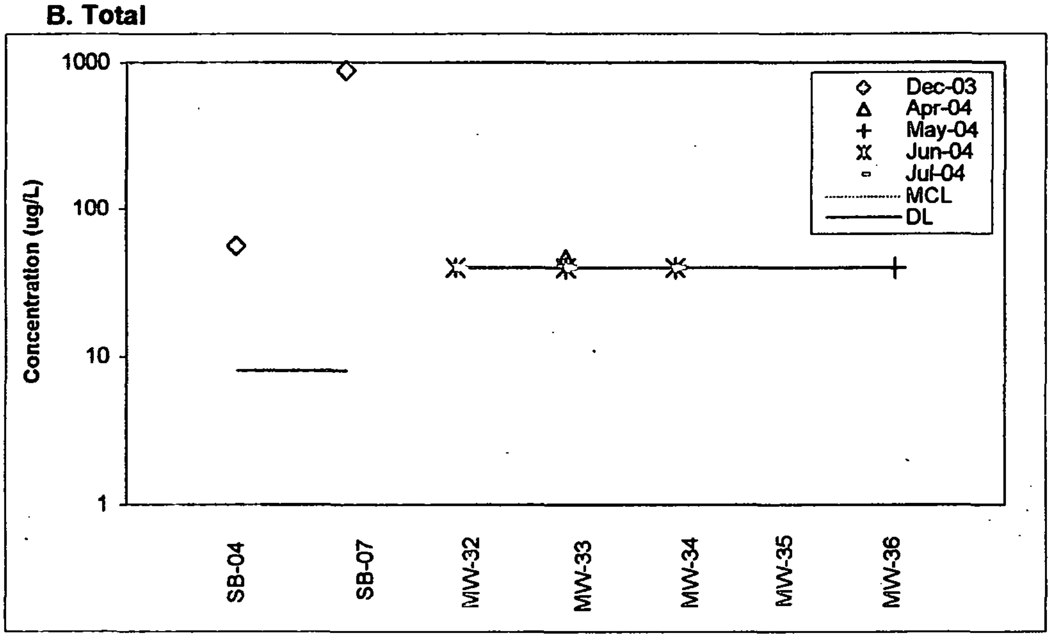
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-16. Spatial and Temporal Distribution of Nickel in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

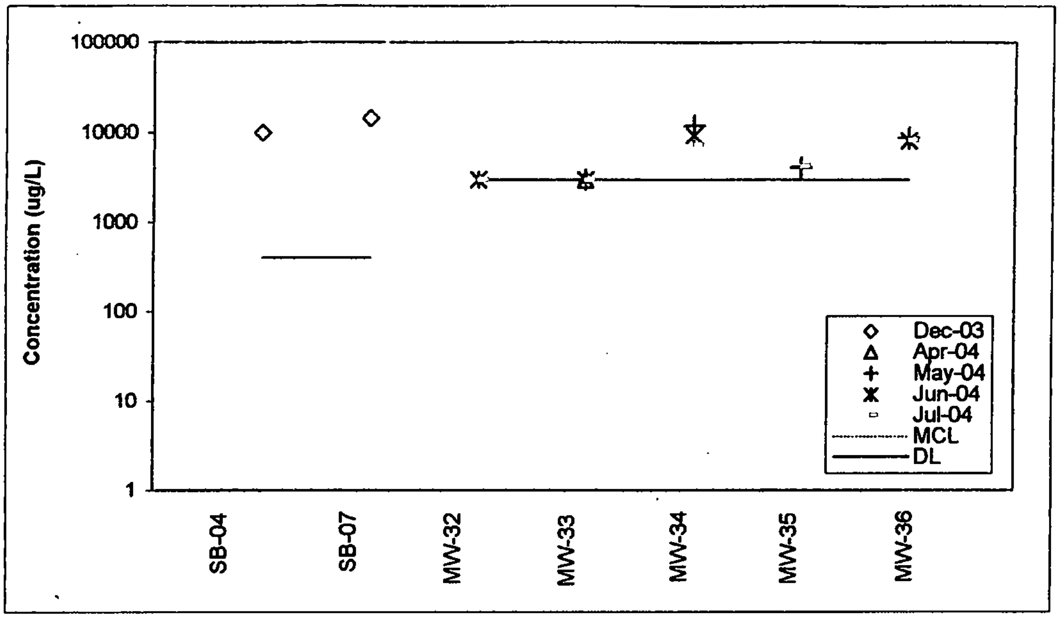
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

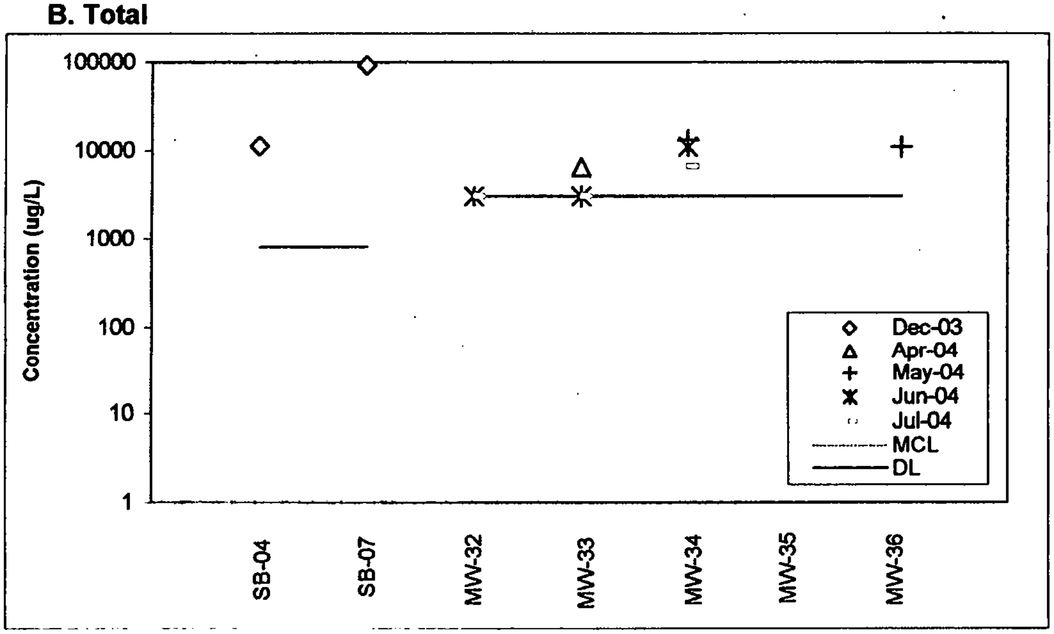
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-17. Spatial and Temporal Distribution of Potassium in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

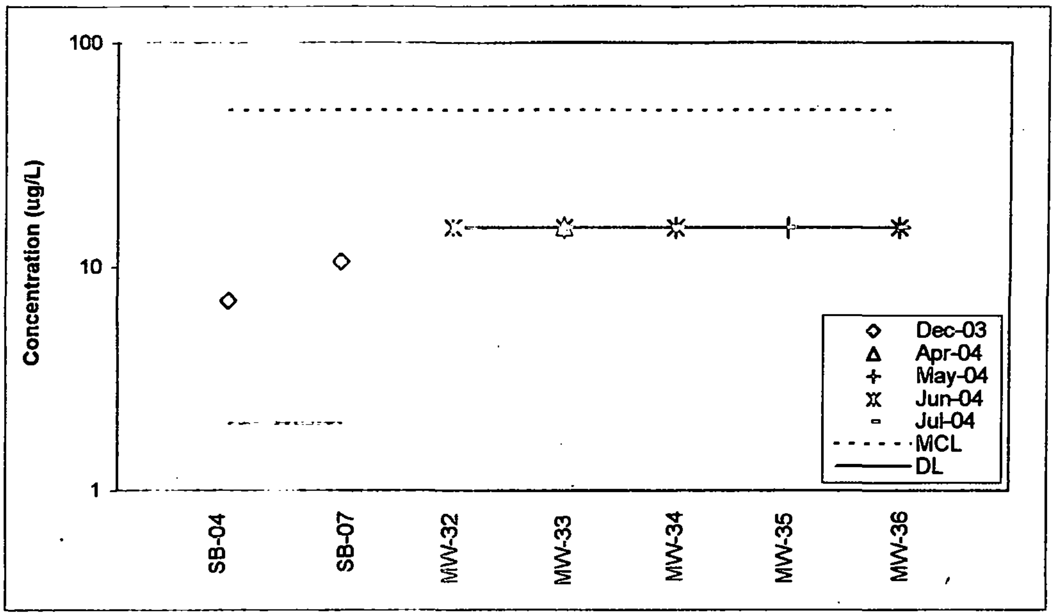
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

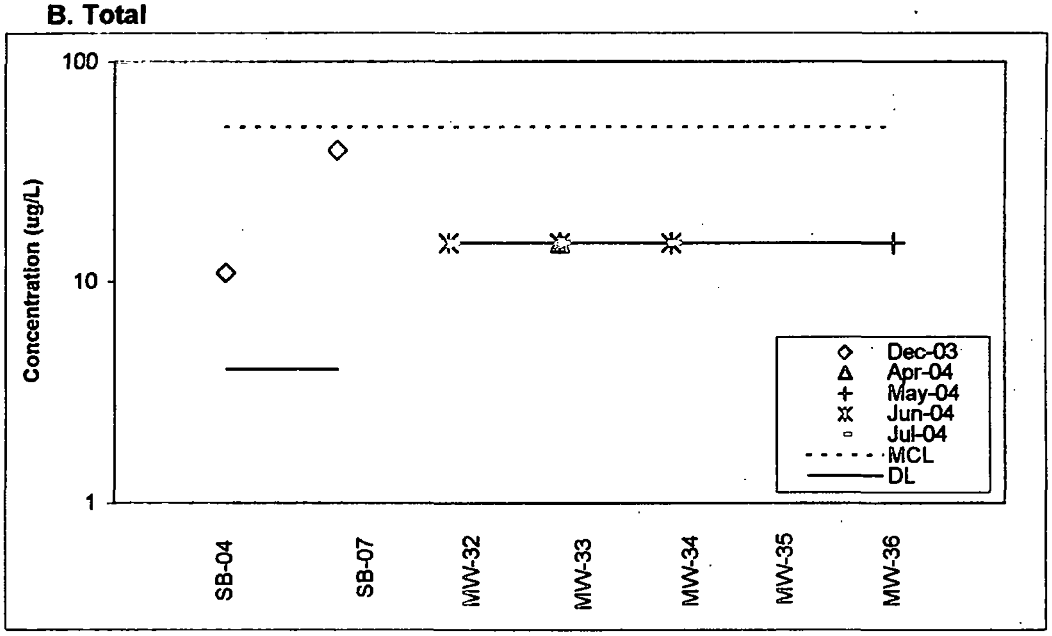
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-18. Spatial and Temporal Distribution of Selenium in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

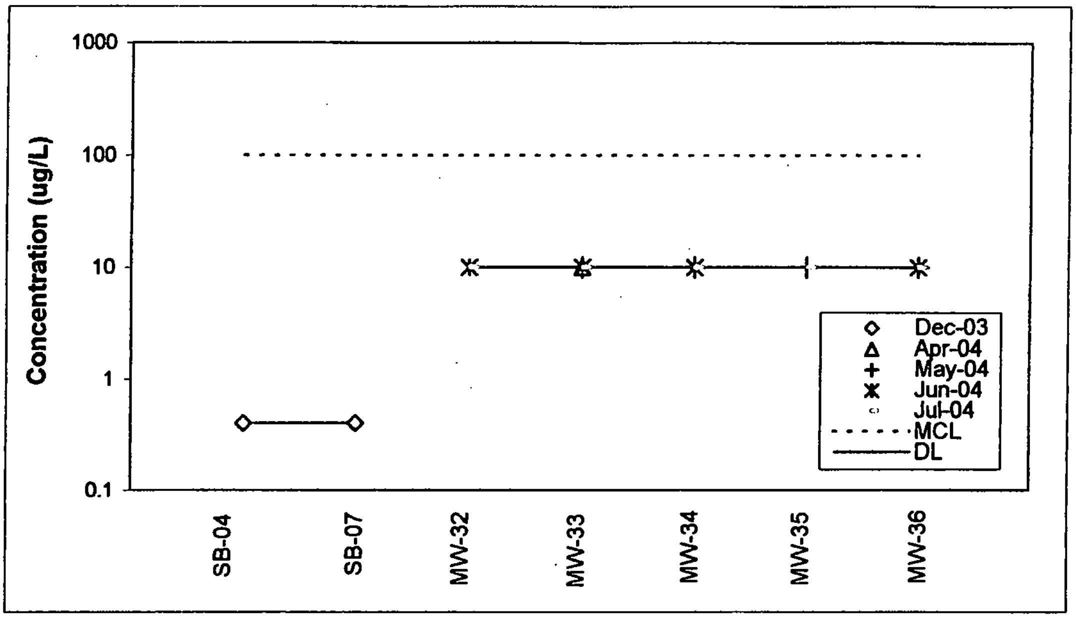
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

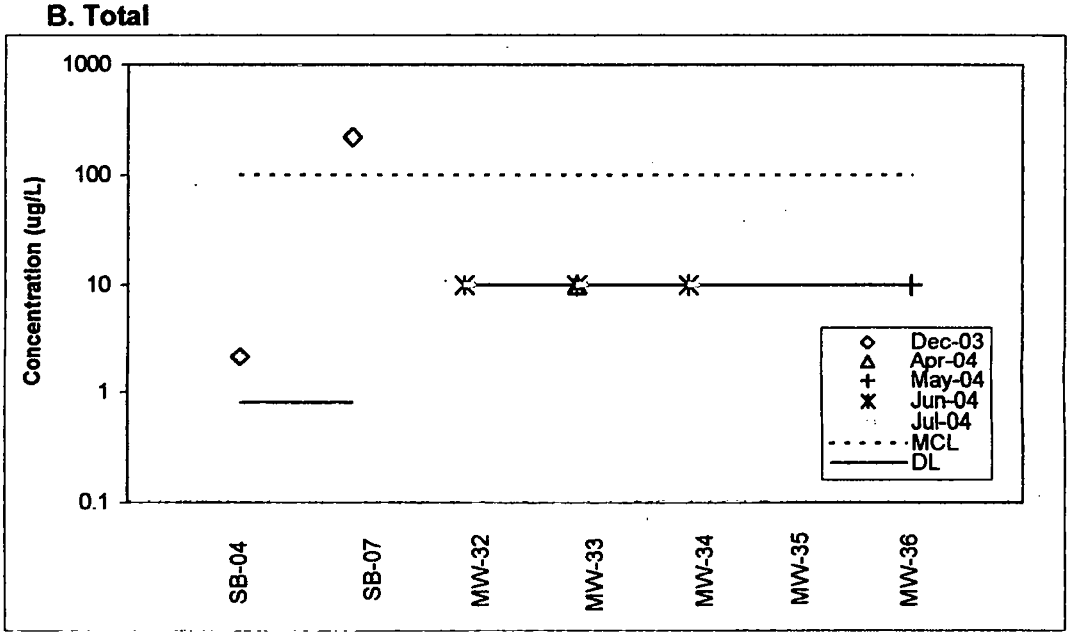
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-19. Spatial and Temporal Distribution of Silver in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

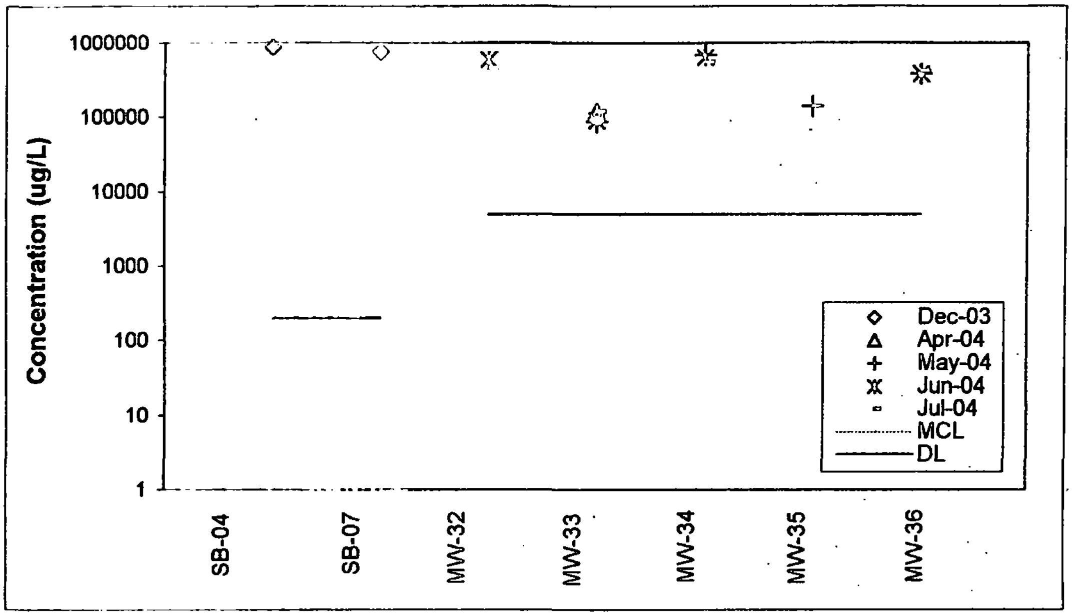
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

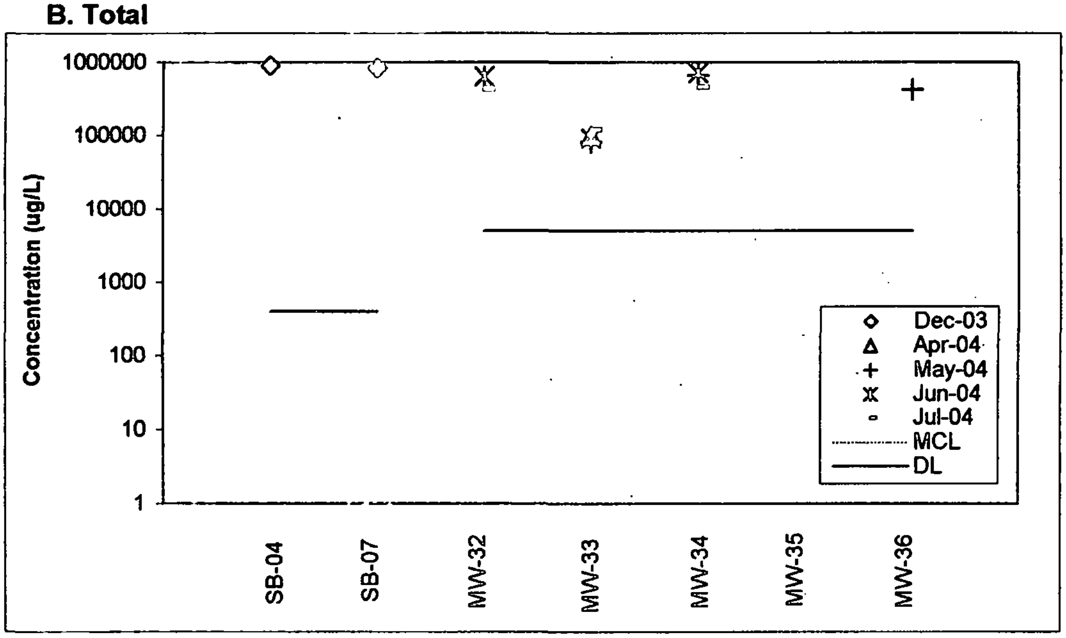
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-20. Spatial and Temporal Distribution of Sodium in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

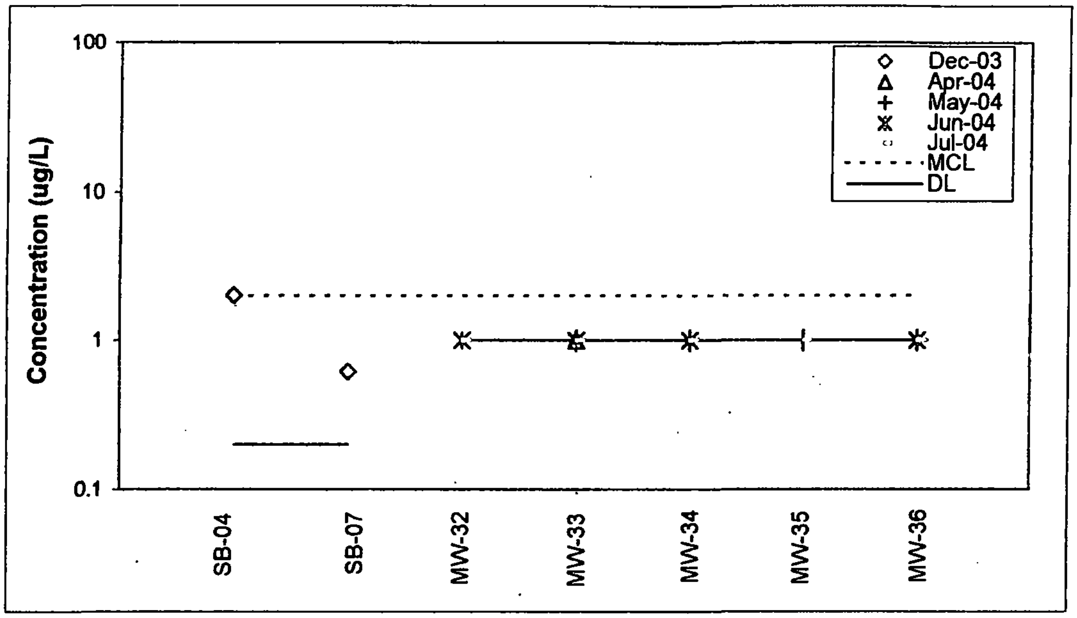
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

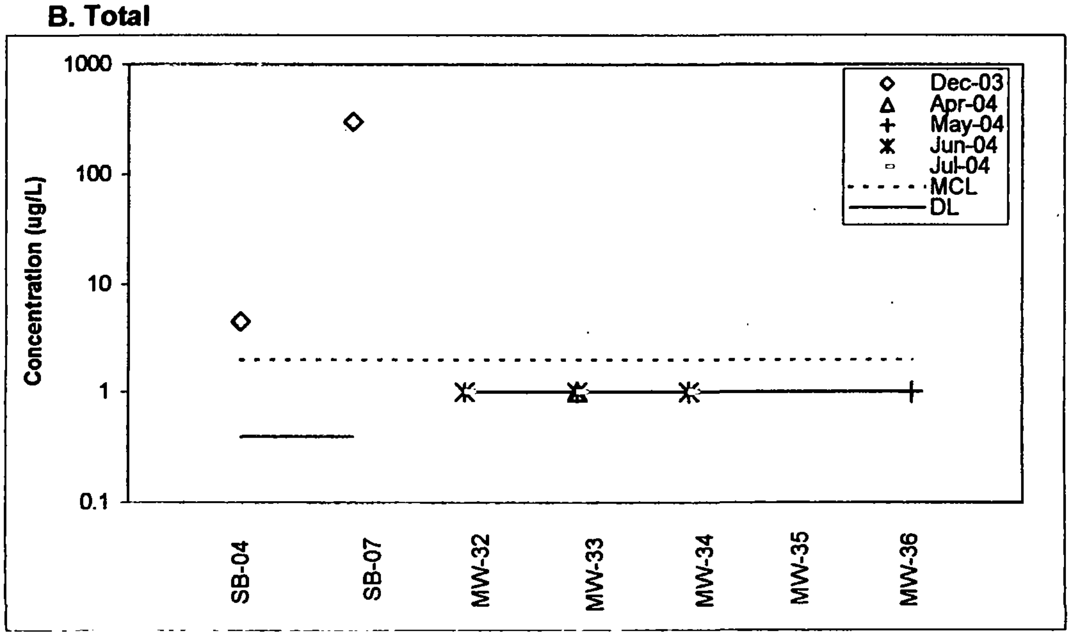
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-21. Spatial and Temporal Distribution of Thallium in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

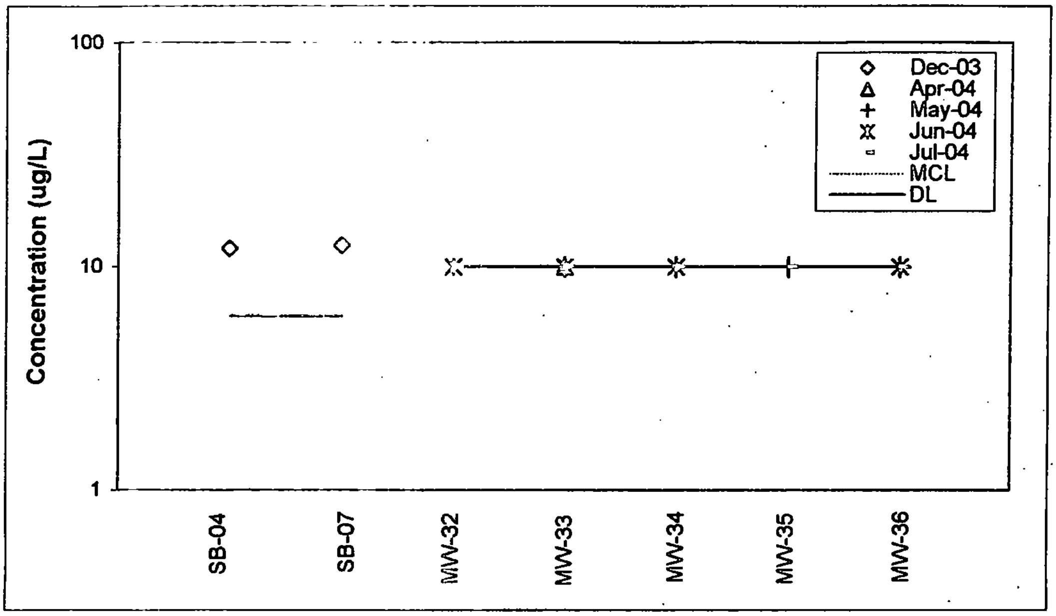
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

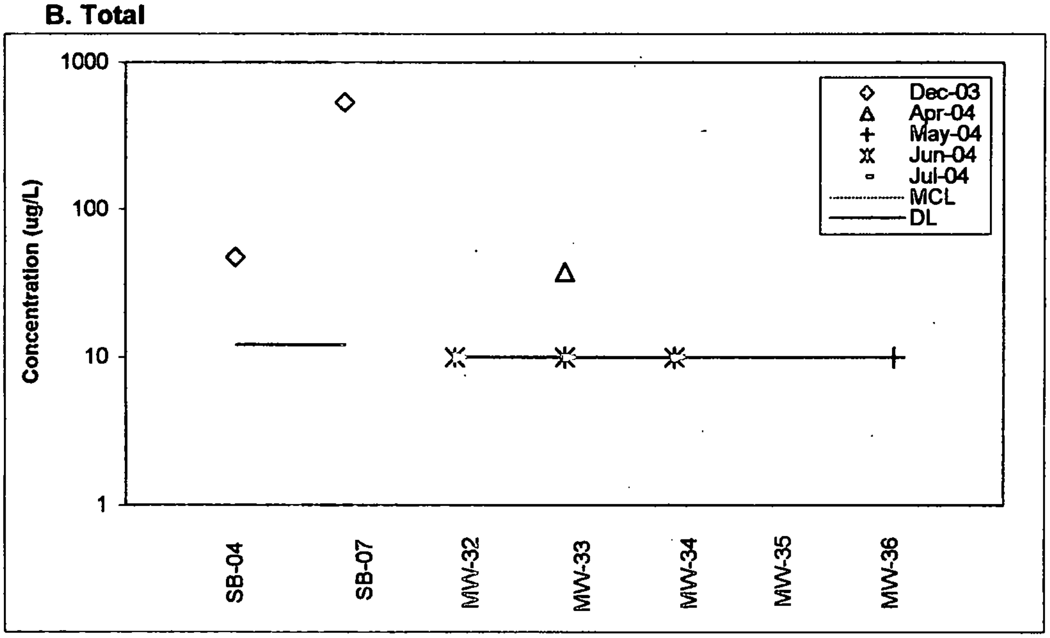
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-22. Spatial and Temporal Distribution of Vanadium in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

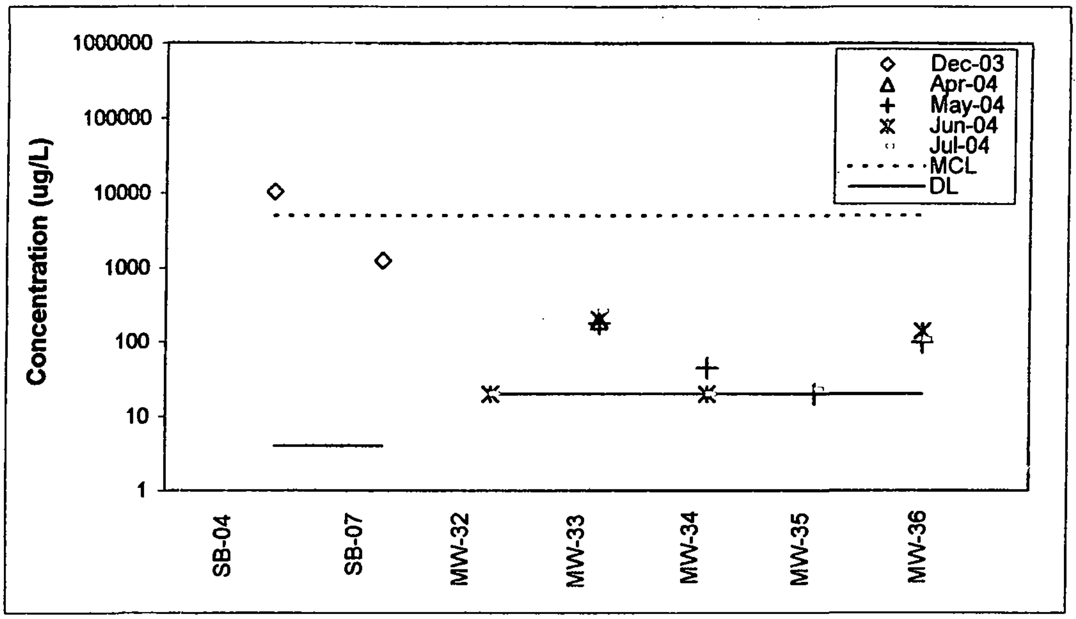
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

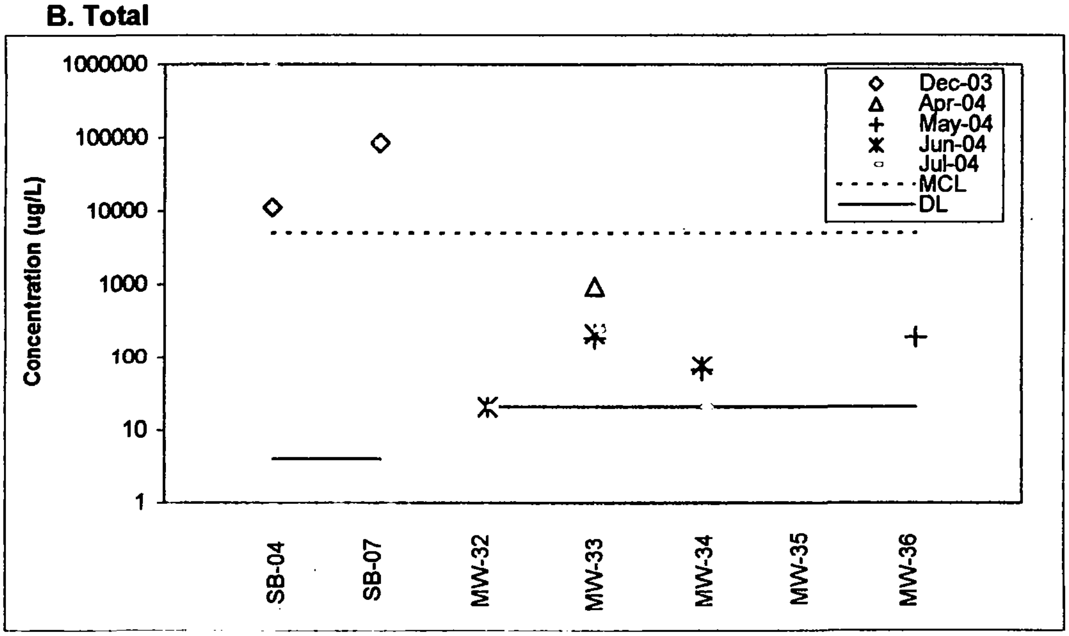
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

Figure G-23. Spatial and Temporal Distribution of Zinc in Groundwater

A. Dissolved



B. Total



Concentrations are plotted on a log scale

Total metals sample not collected at MW-35

MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

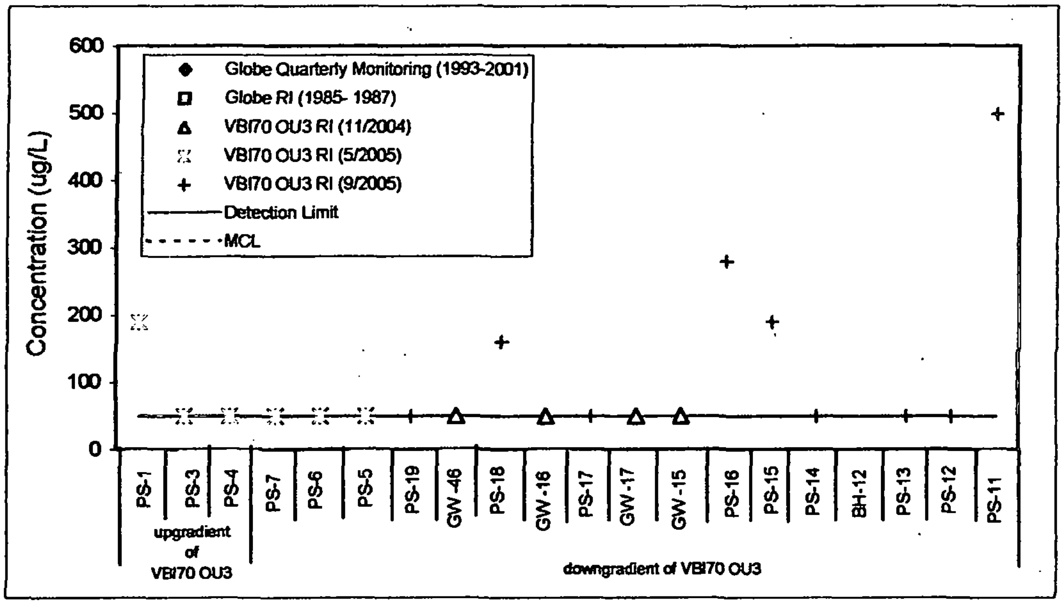
Note: different laboratories were used for analysis of Round 1 (SB-04 and SB-07) and Round 2 (MW-32 through MW-36) samples, thus detection limits may differ for a chemical.

APPENDIX H

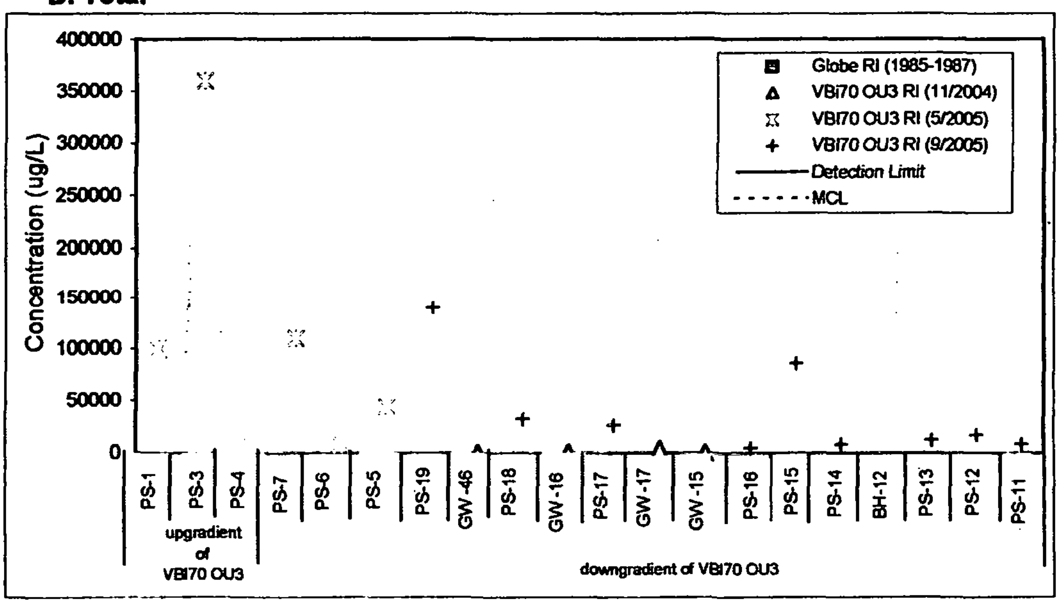
NATURE AND EXTENT OF OFF-SITE GROUNDWATER CONTAMINATION

Figure H-1. Spatial and Temporal Distribution of Aluminum in Off-Site Groundwater

A. Dissolved



B. Total



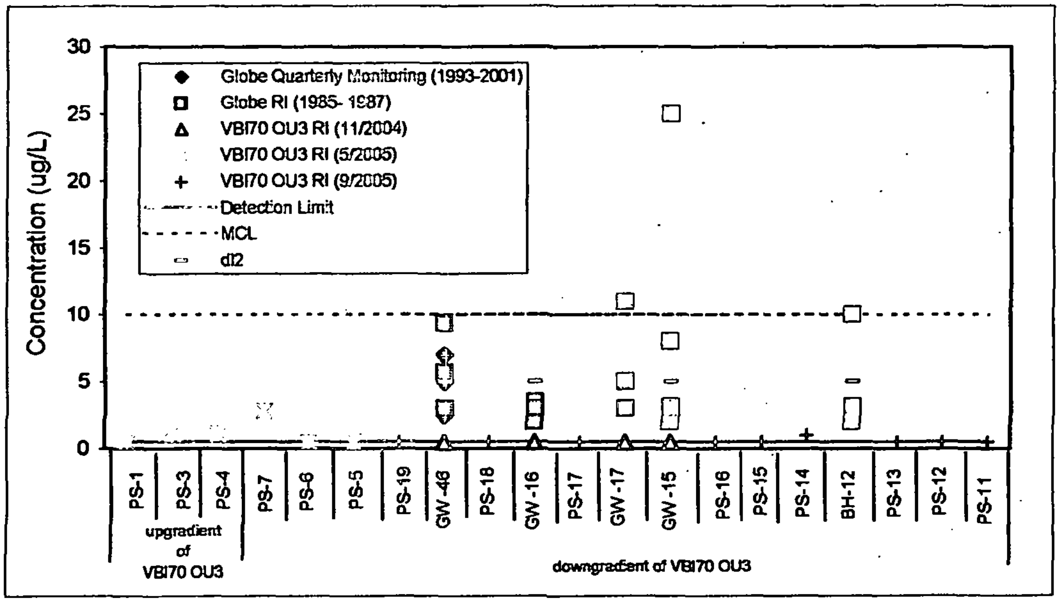
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

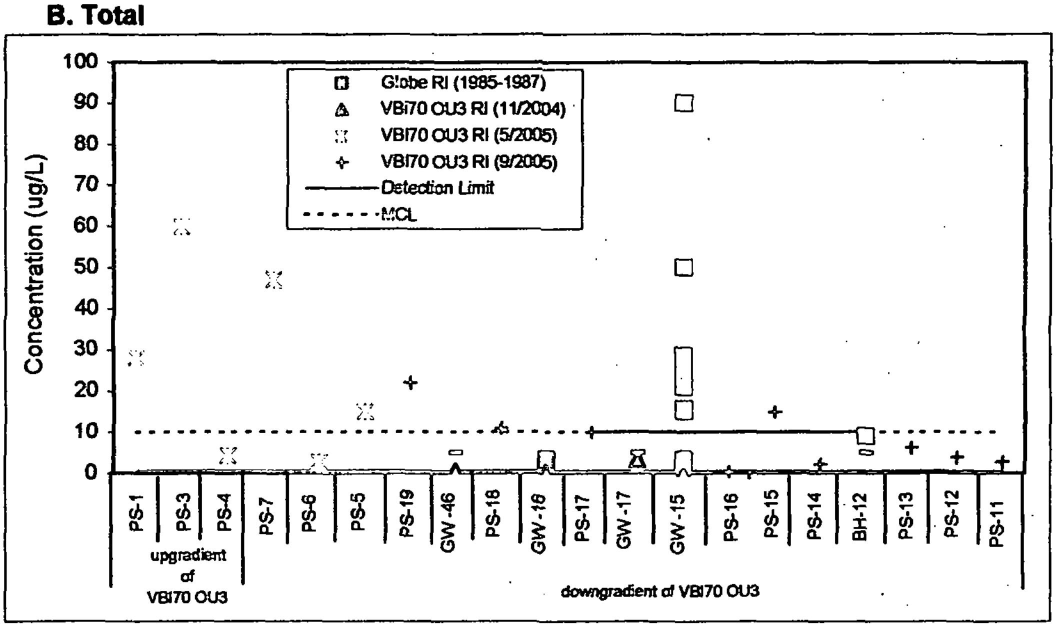
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-3. Spatial and Temporal Distribution of Arsenic in Off-Site Groundwater

A. Dissolved



B. Total



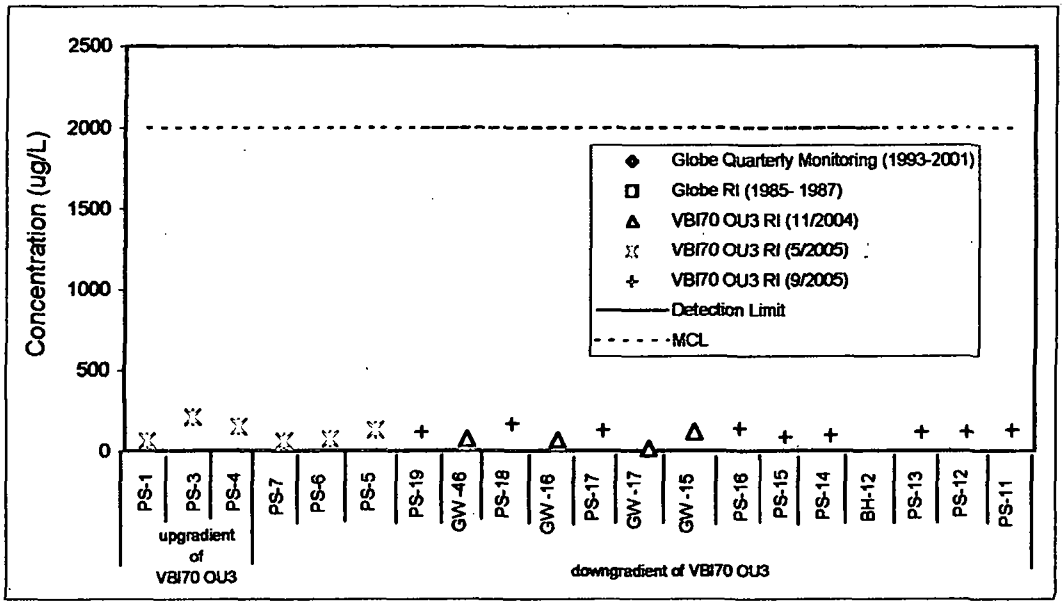
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

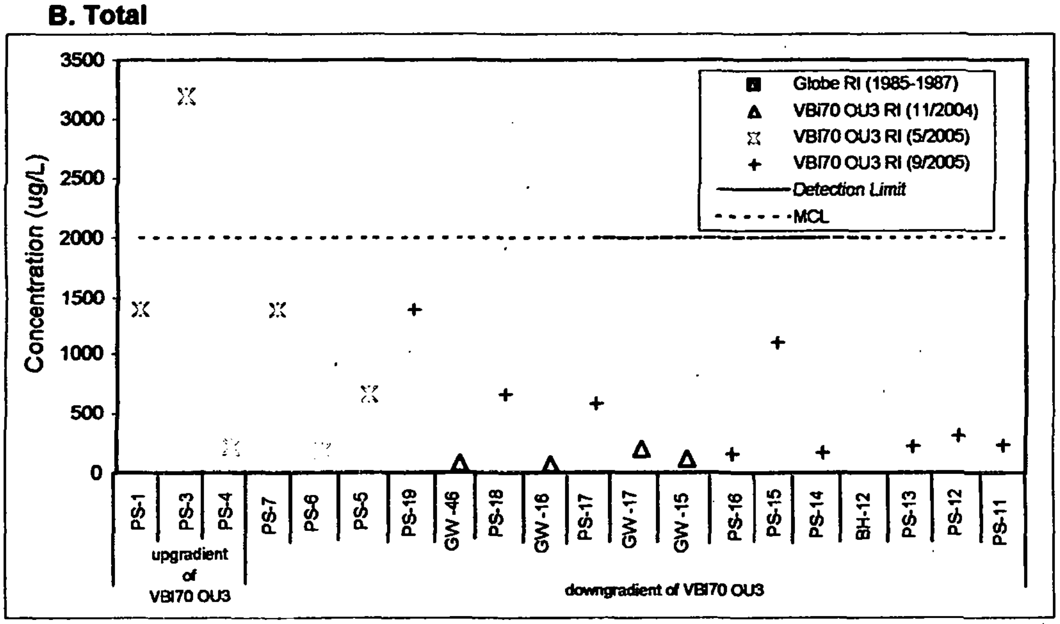
Note: *different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.*

Figure H-4. Spatial and Temporal Distribution of Barium in Off-Site Groundwater

A. Dissolved



B. Total



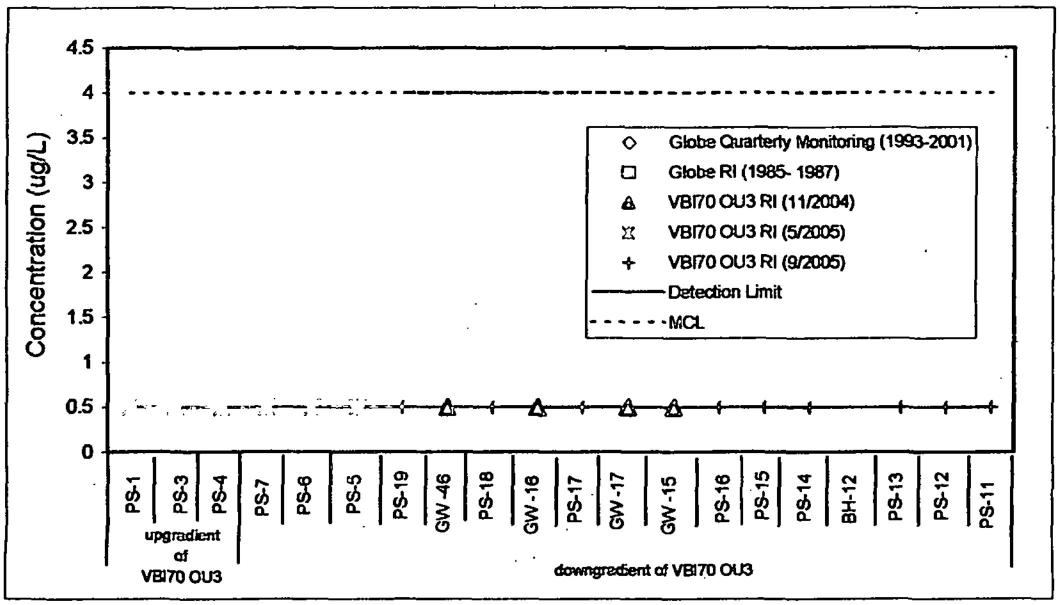
MCL = Maximum Contaminant Level

DL = Delection Limit. Concentration values at or below this line are considered non-detect.

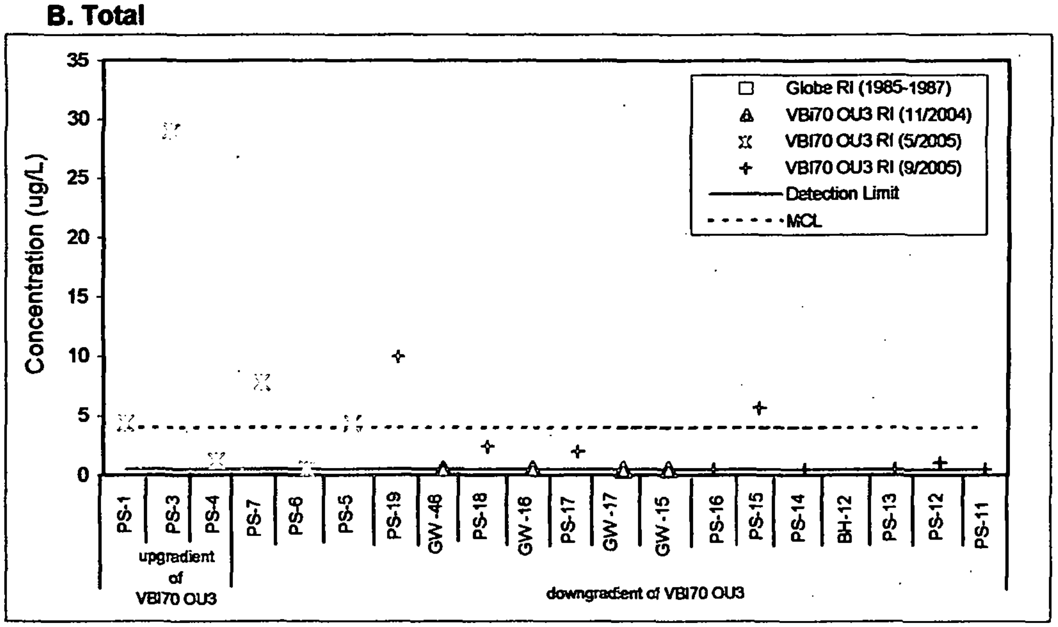
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-5. Spatial and Temporal Distribution of Beryllium in Off-Site Groundwater

A. Dissolved



B. Total



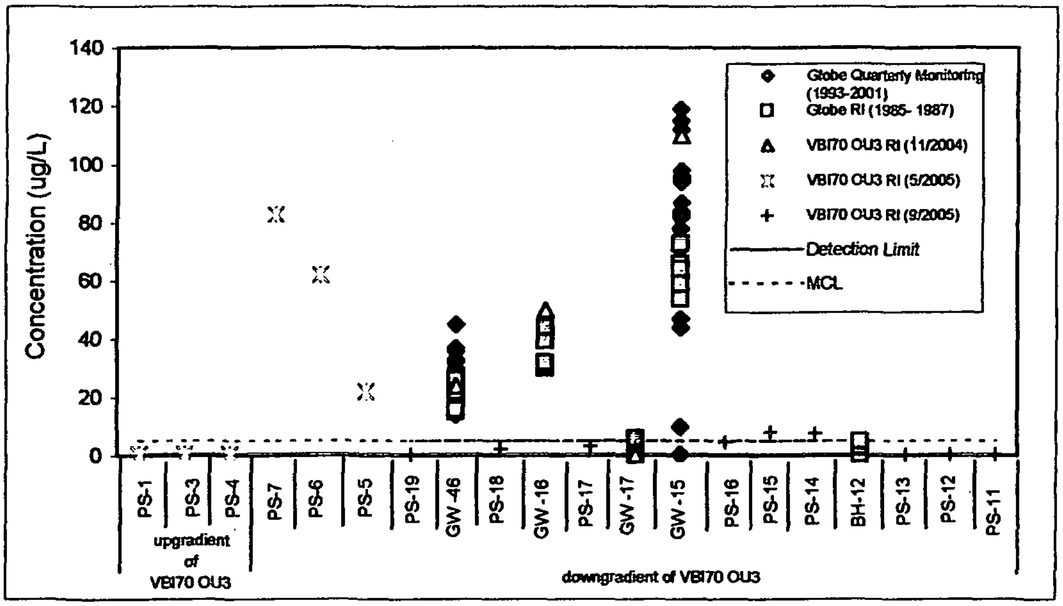
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

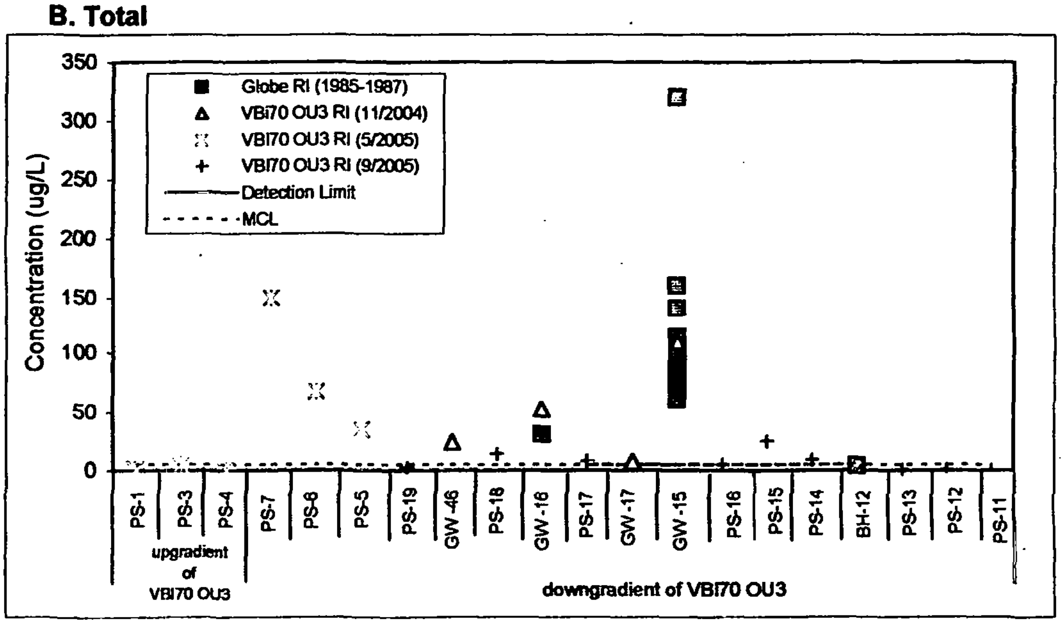
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-6. Spatial and Temporal Distribution of Cadmium in Off-Site Groundwater

A. Dissolved



B. Total



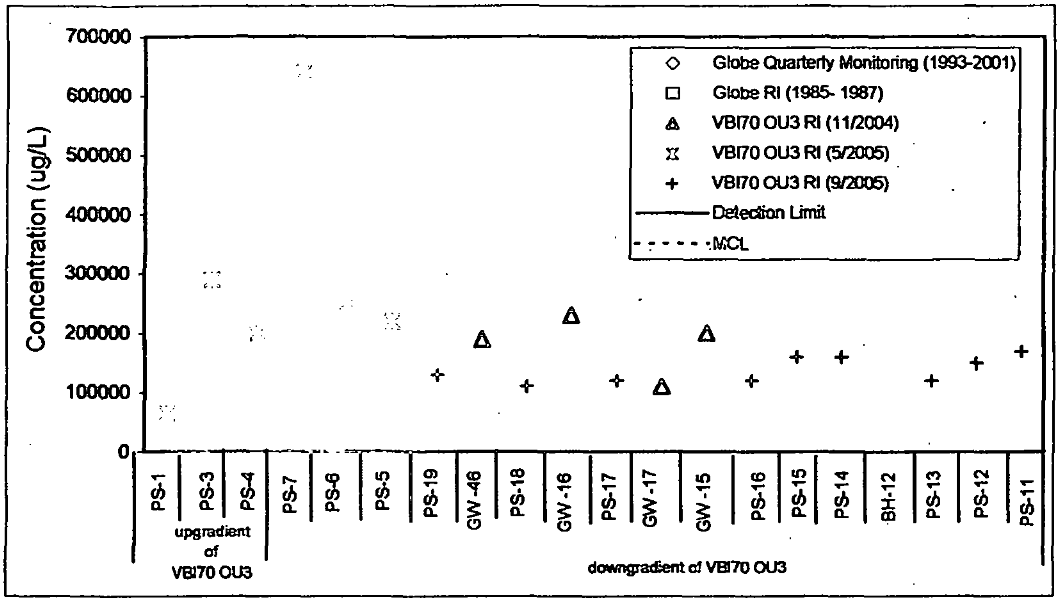
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

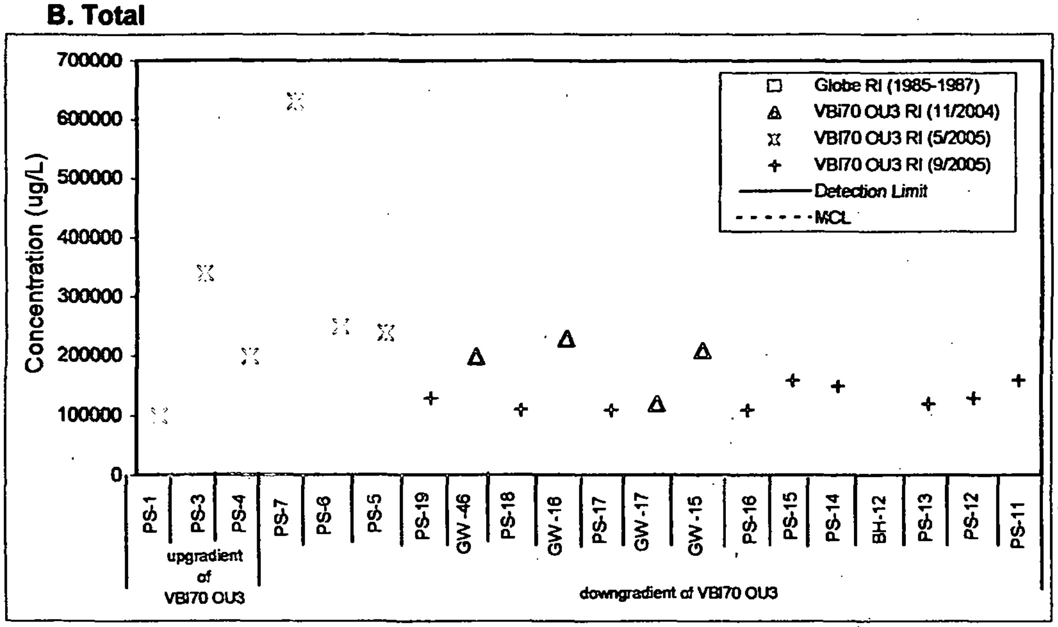
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-7. Spatial and Temporal Distribution of Calcium in Off-Site Groundwater

A. Dissolved



B. Total



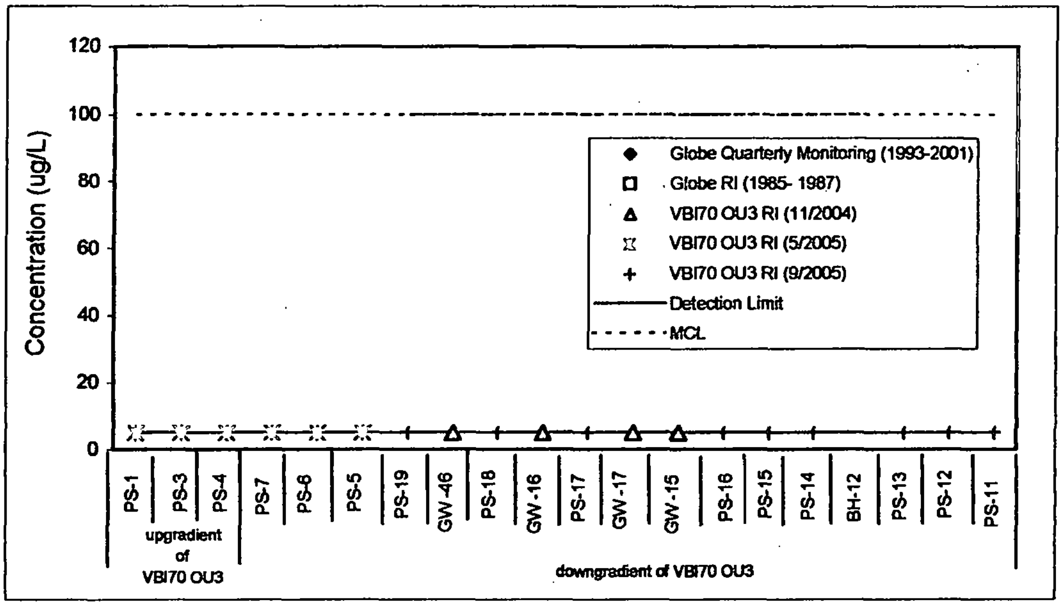
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

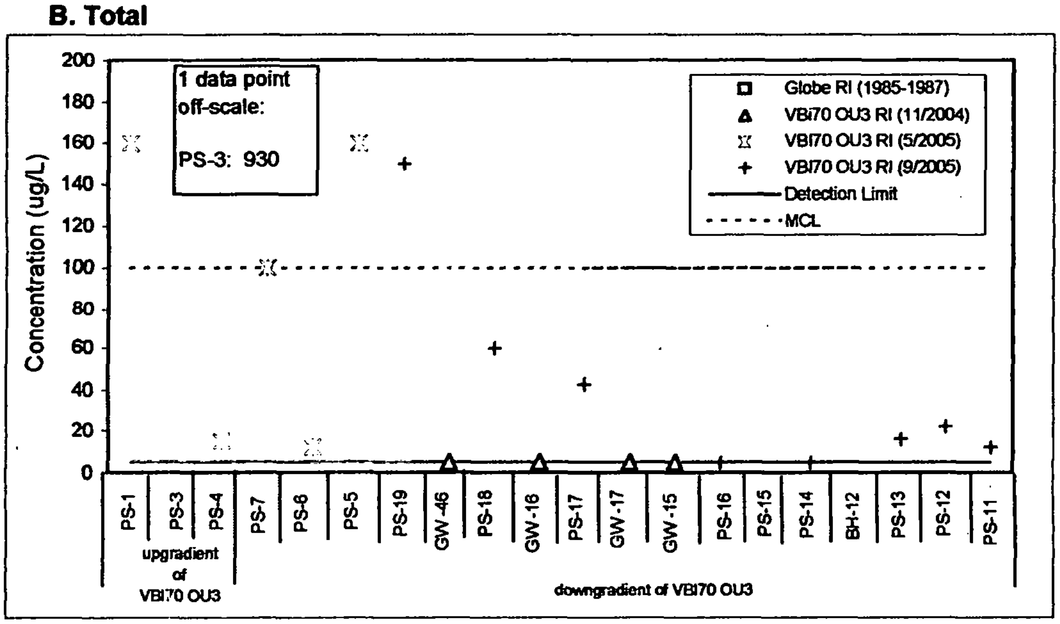
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-8. Spatial and Temporal Distribution of Chromium in Off-Site Groundwater

A. Dissolved



B. Total



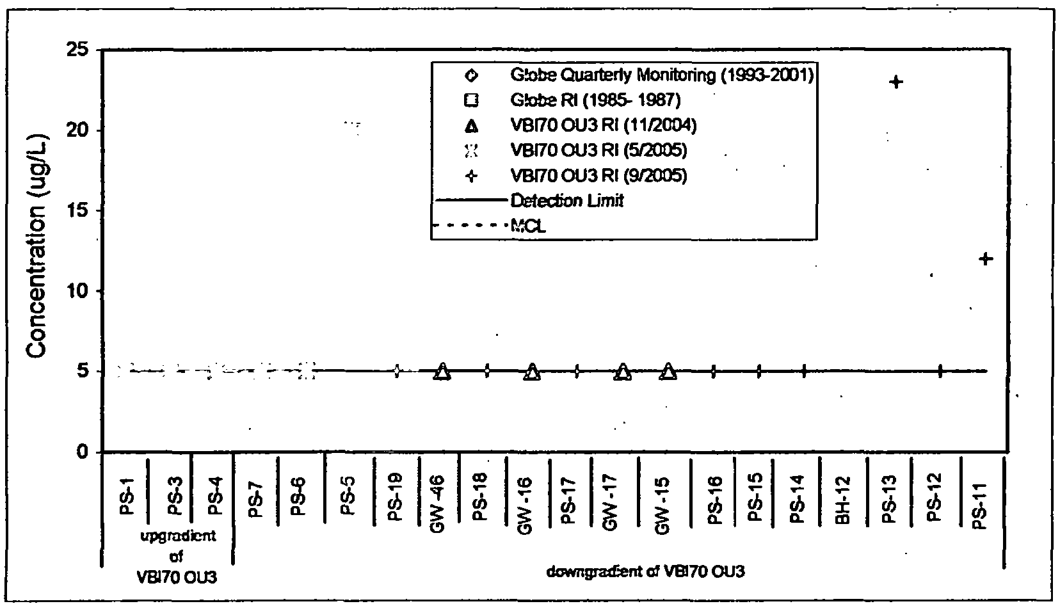
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

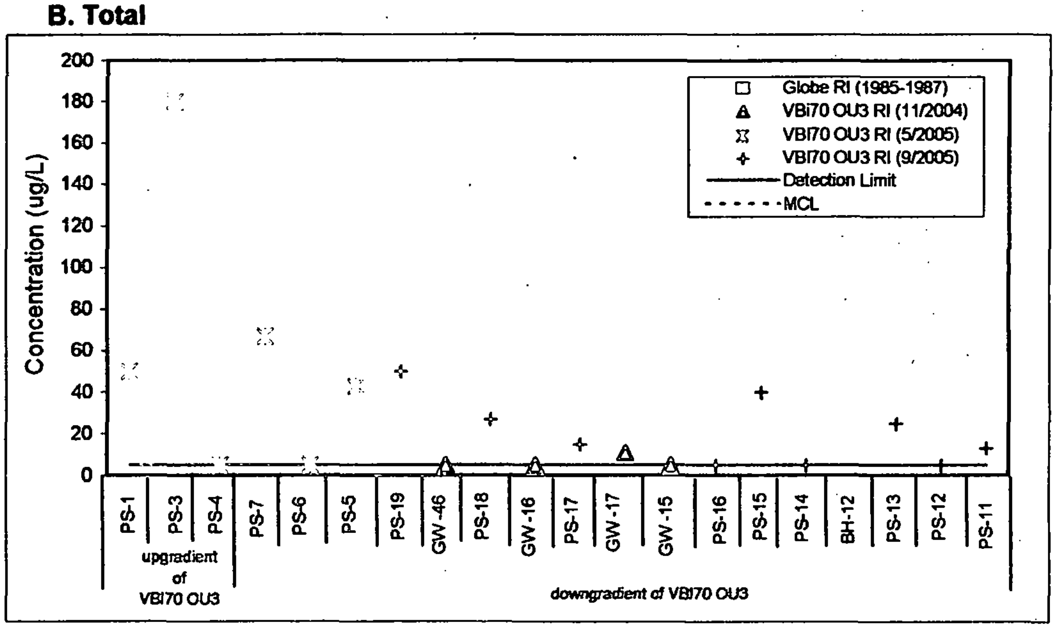
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-9. Spatial and Temporal Distribution of Cobalt in Off-Site Groundwater

A. Dissolved



B. Total



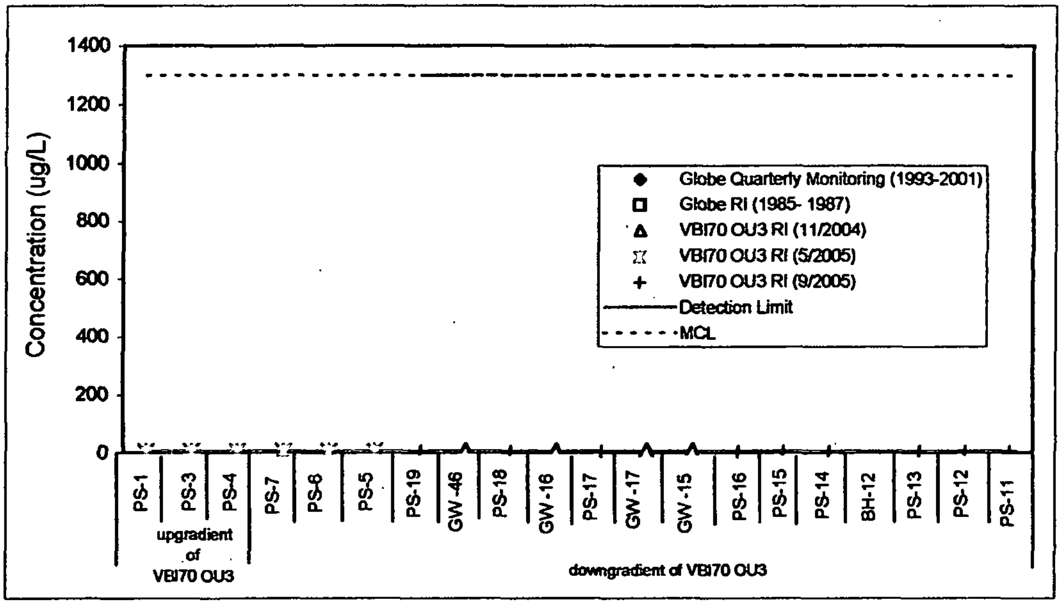
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

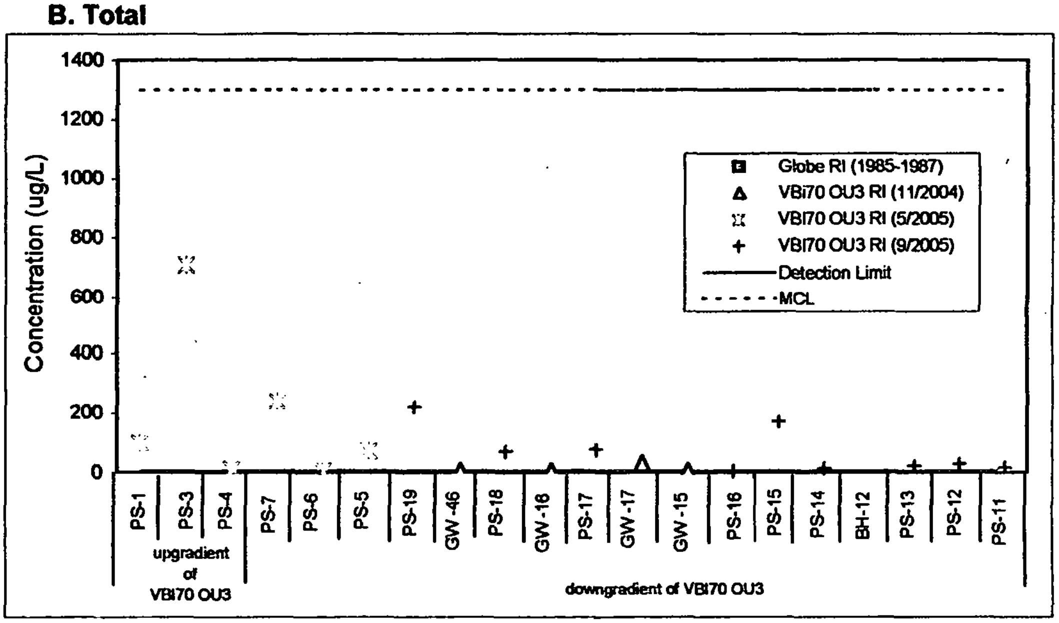
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-10. Spatial and Temporal Distribution of Copper in Off-Site Groundwater

A. Dissolved



B. Total



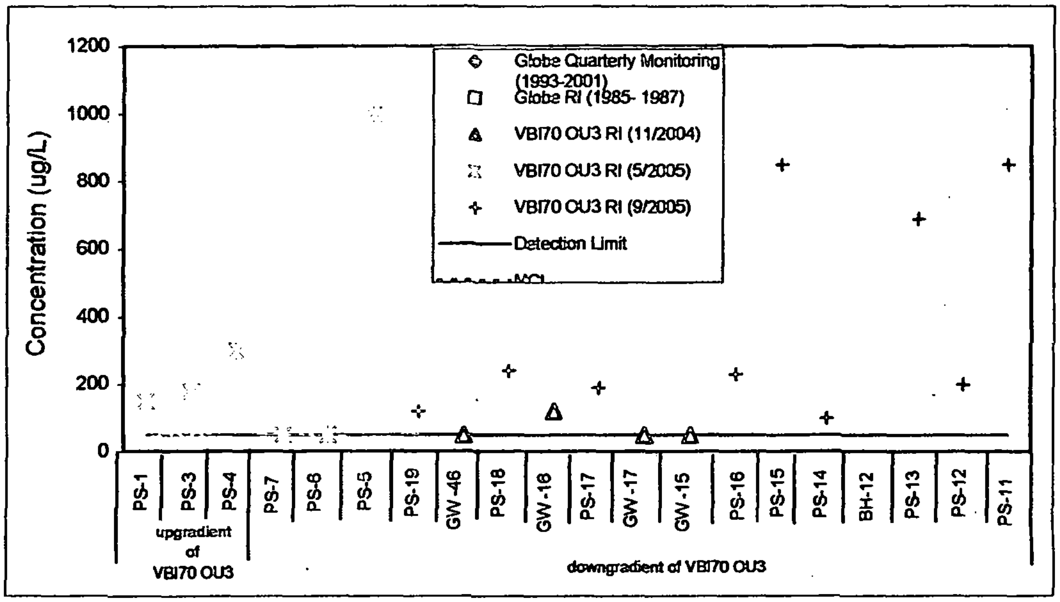
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

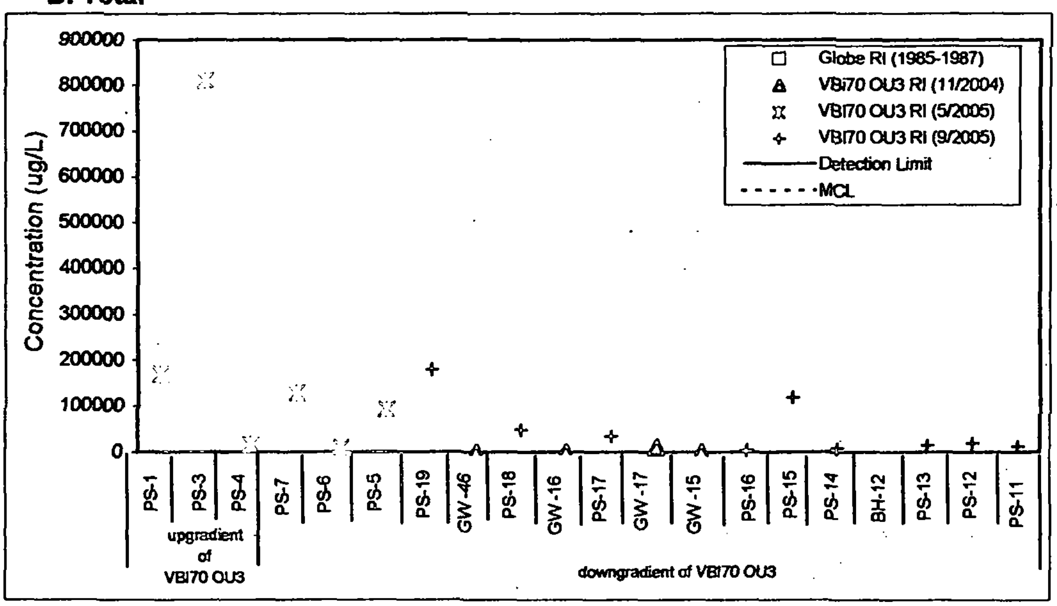
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-11. Spatial and Temporal Distribution of Iron in Off-Site Groundwater

A. Dissolved



B. Total



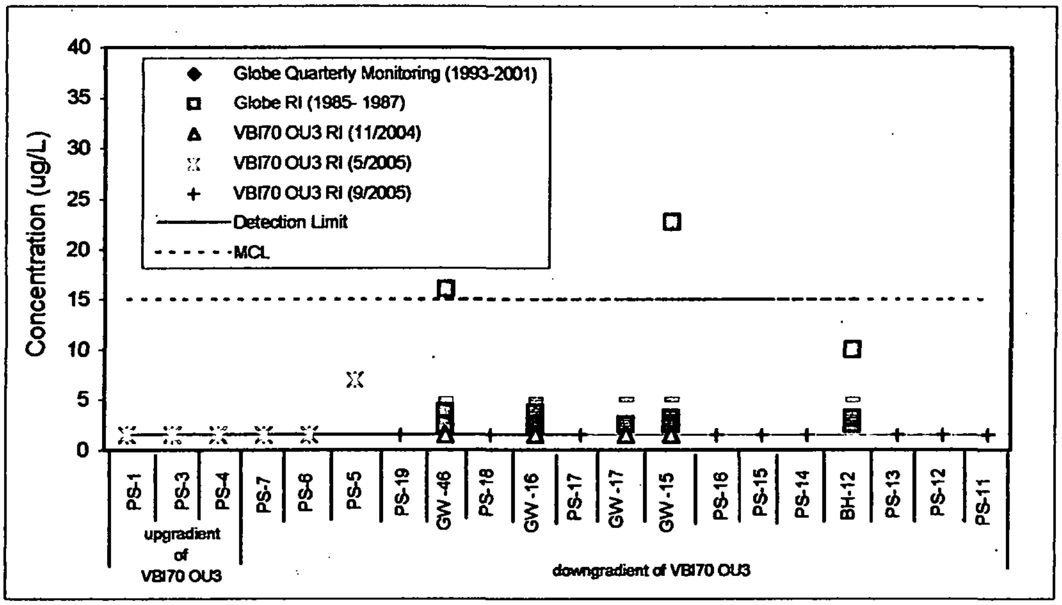
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

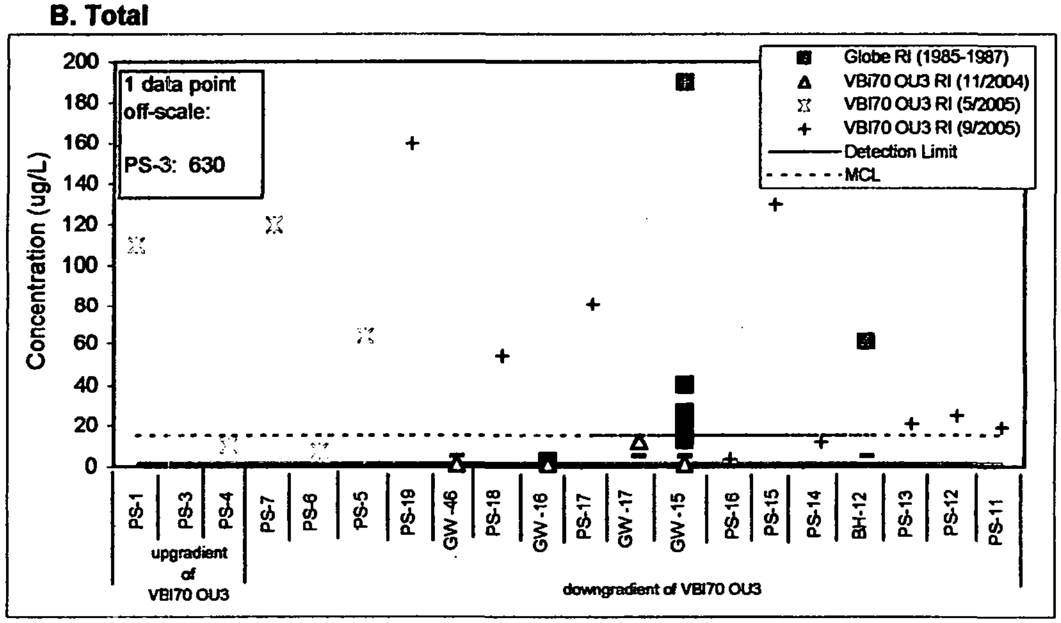
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-12. Spatial and Temporal Distribution of Lead in Off-Site Groundwater

A. Dissolved



B. Total



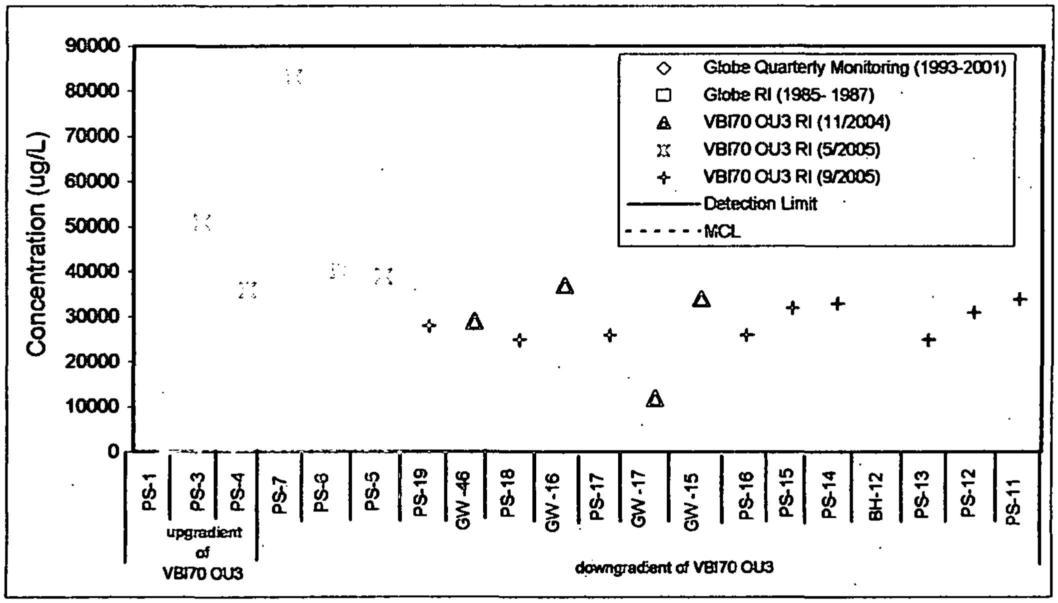
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

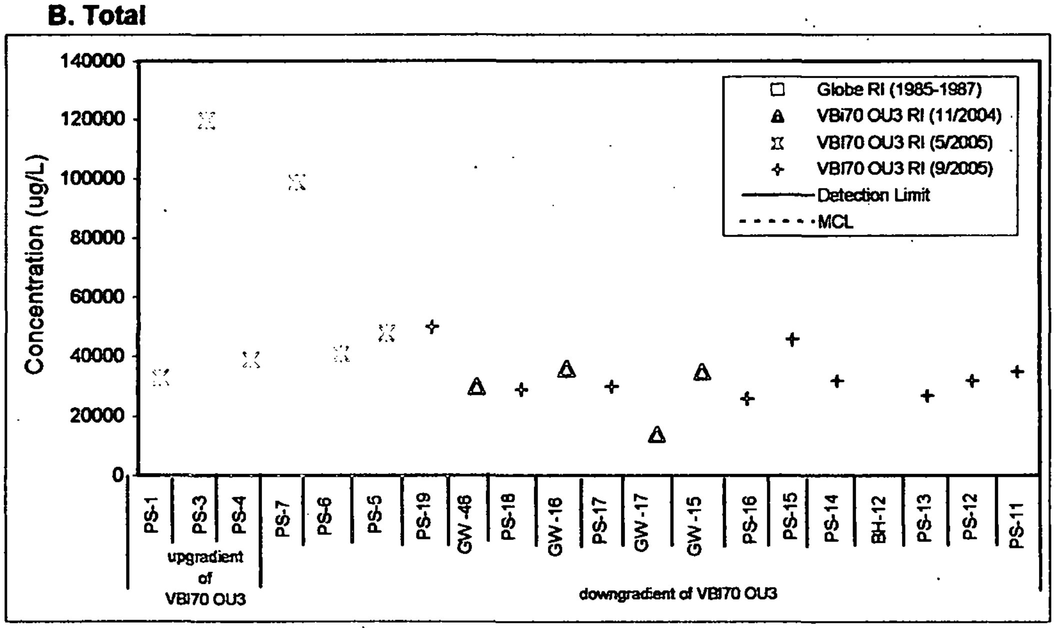
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-13. Spatial and Temporal Distribution of Magnesium in Off-Site Groundwater

A. Dissolved



B. Total



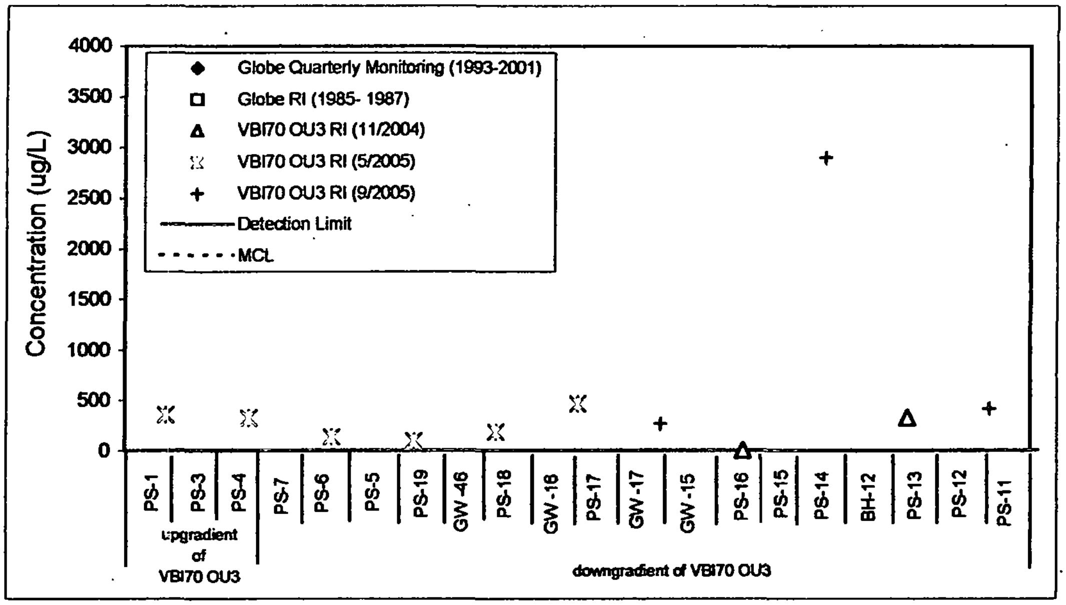
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

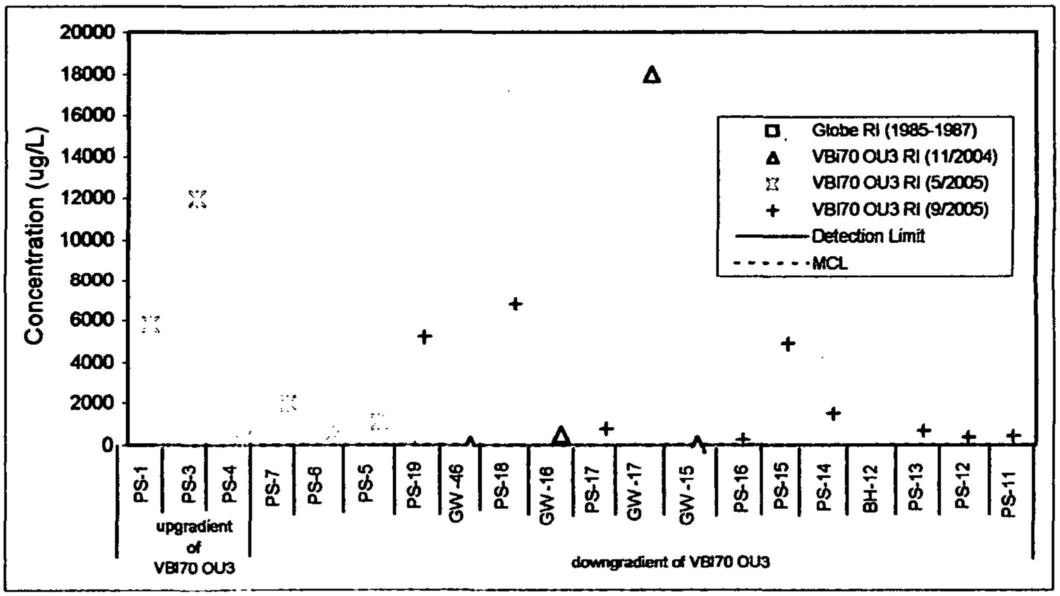
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-14. Spatial and Temporal Distribution of Manganese in Off-Site Groundwater

A. Dissolved



B. Total



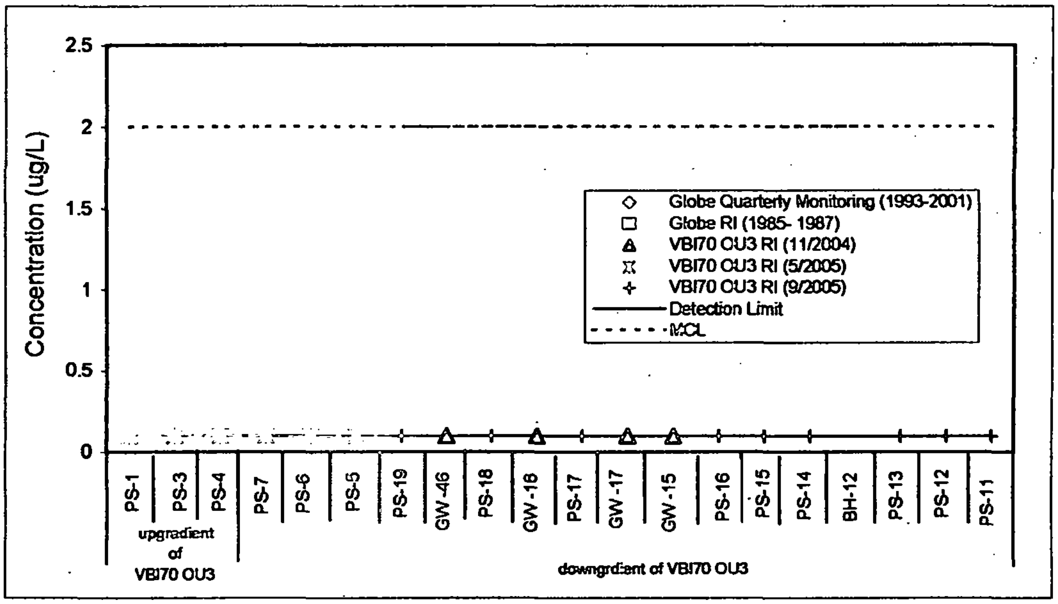
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

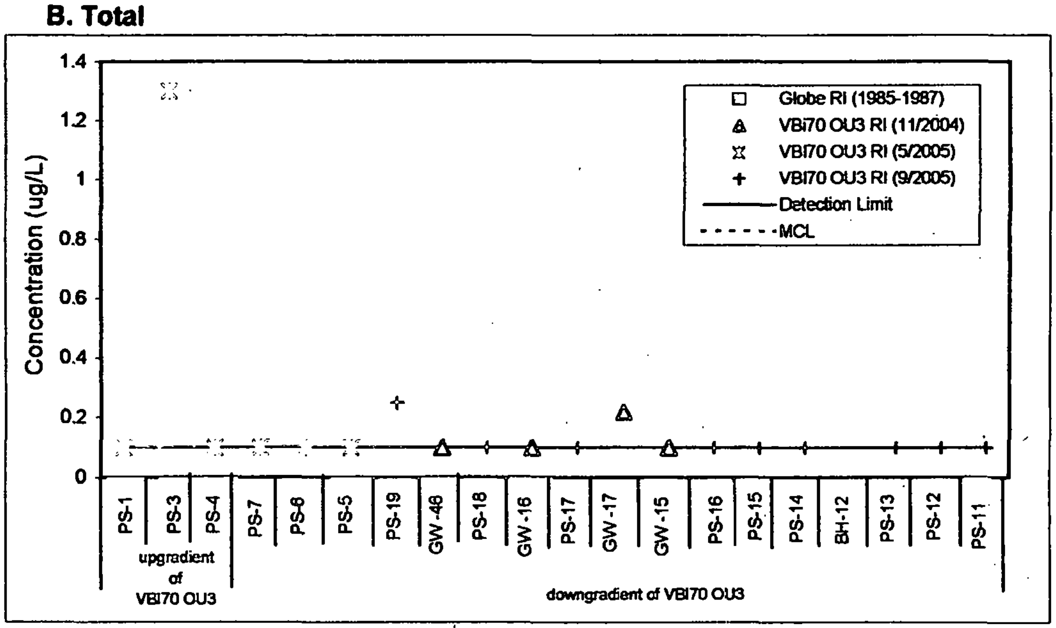
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-15. Spatial and Temporal Distribution of Mercury in Off-Site Groundwater

A. Dissolved



B. Total



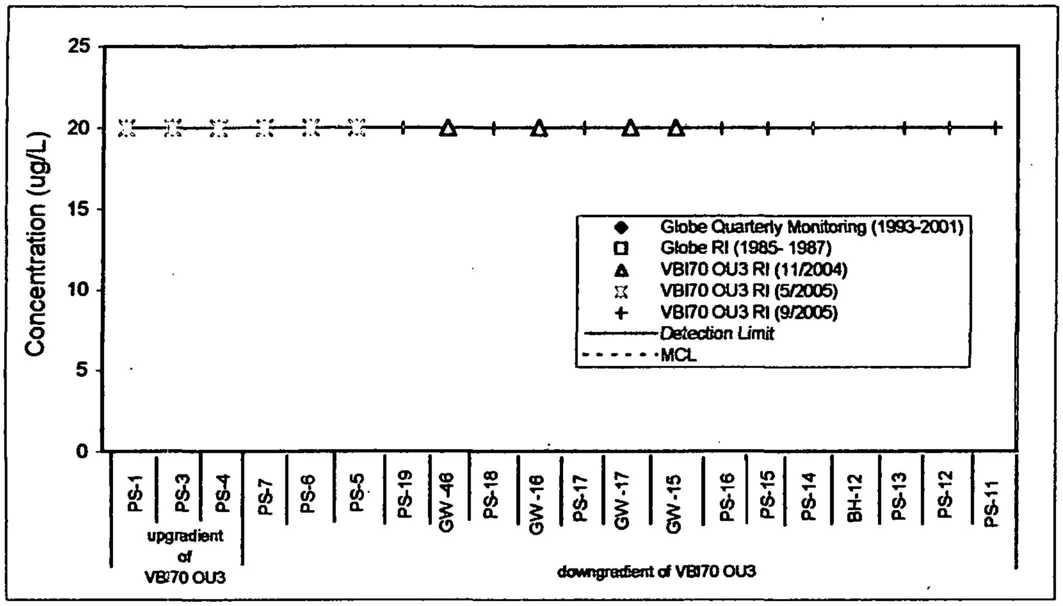
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

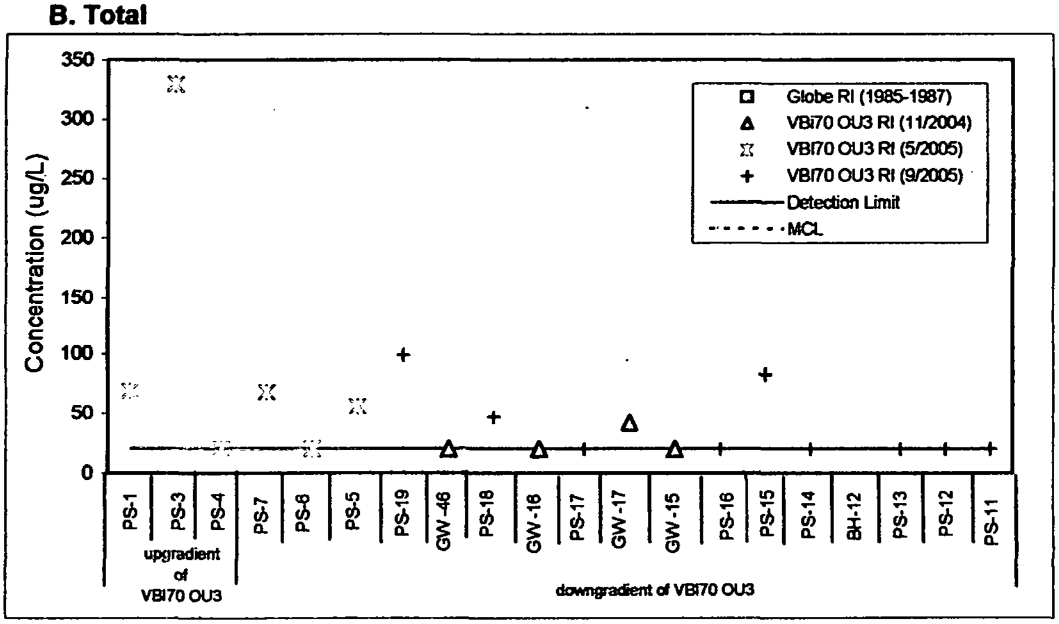
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-16. Spatial and Temporal Distribution of Nickel in Off-Site Groundwater

A. Dissolved



B. Total



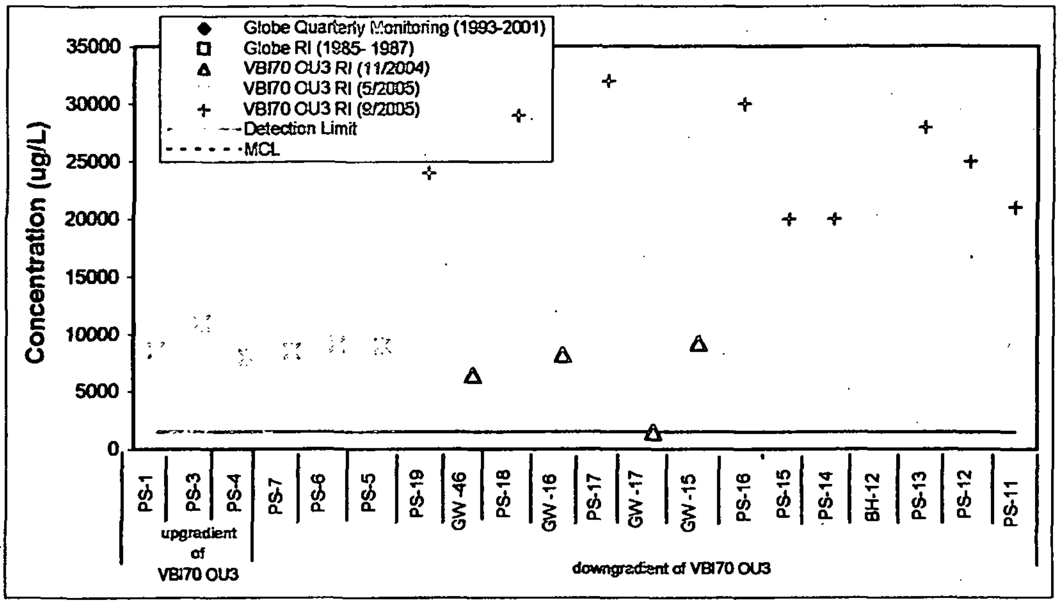
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

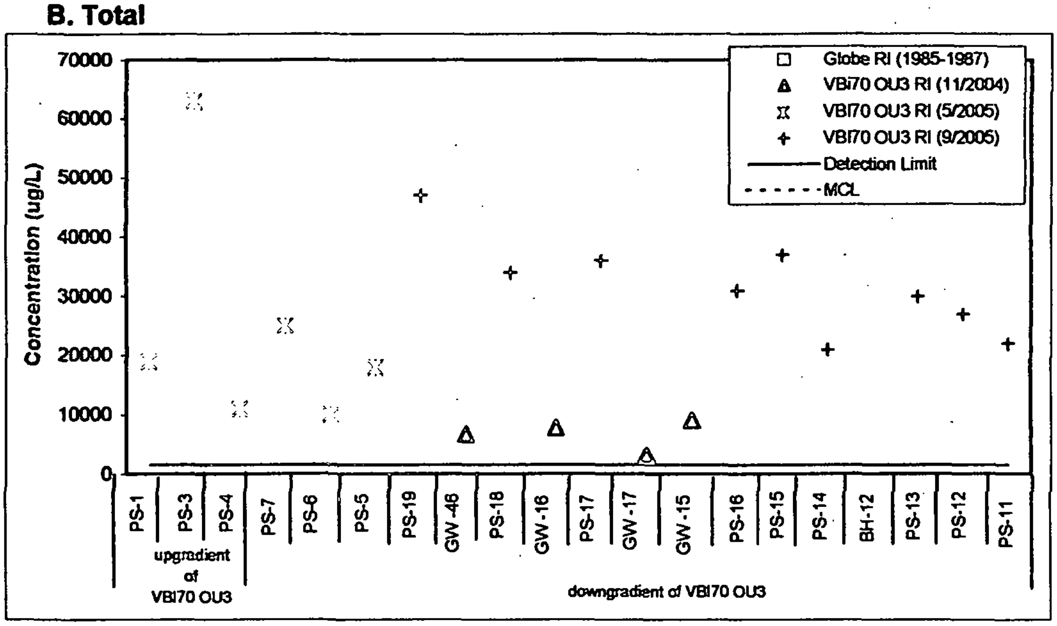
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-17. Spatial and Temporal Distribution of Potassium in Off-Site Groundwater

A. Dissolved



B. Total



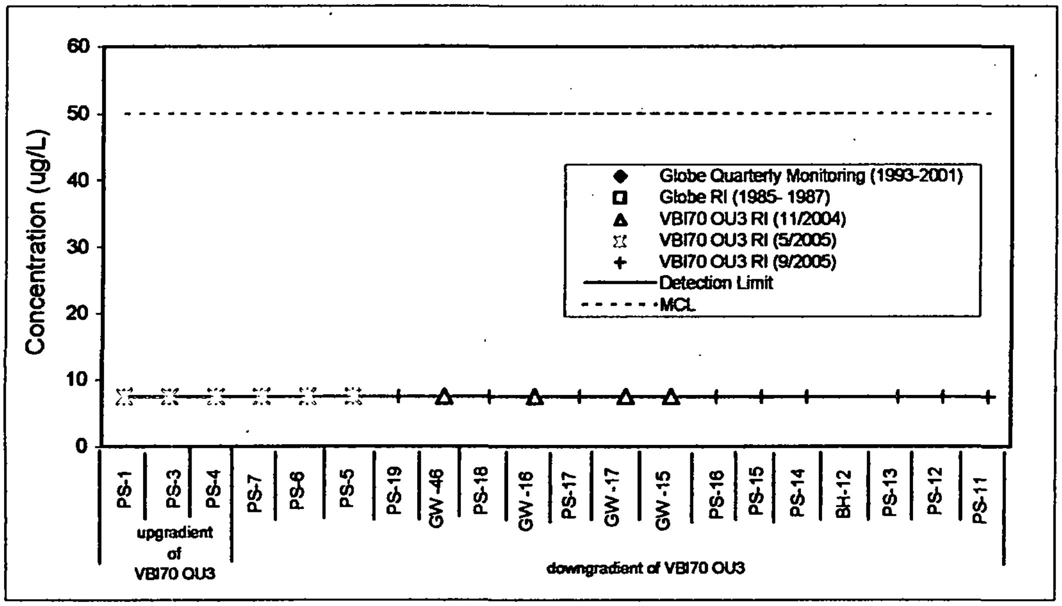
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

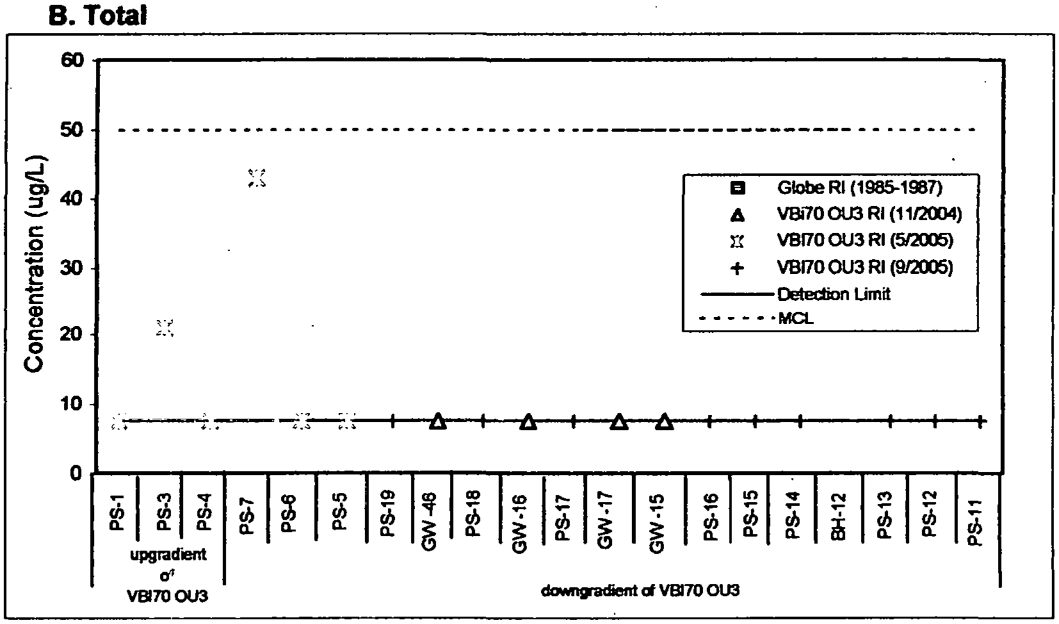
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-18. Spatial and Temporal Distribution of Selenium in Off-Site Groundwater

A. Dissolved



B. Total



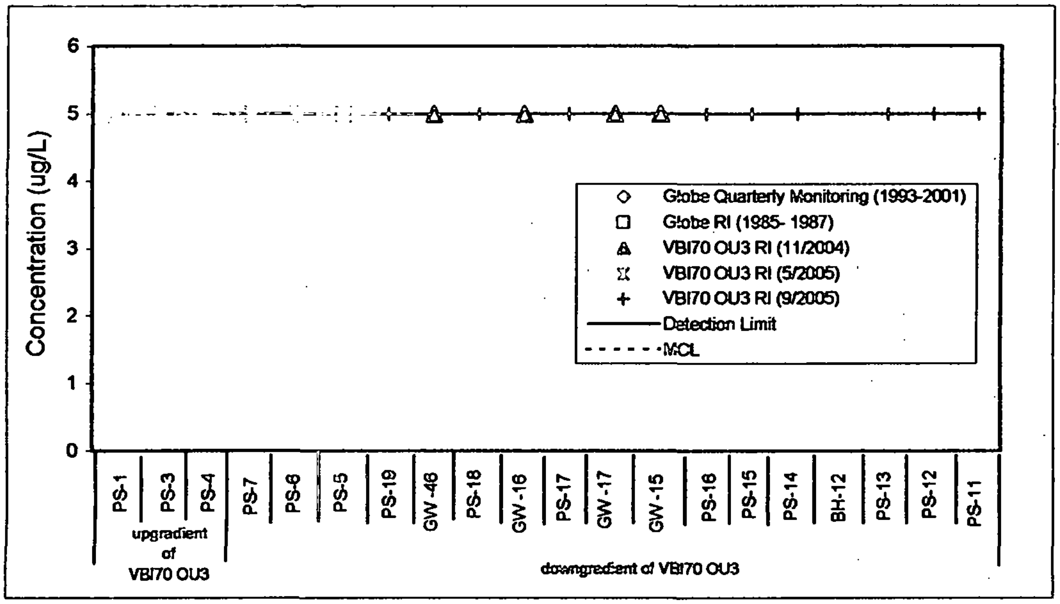
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

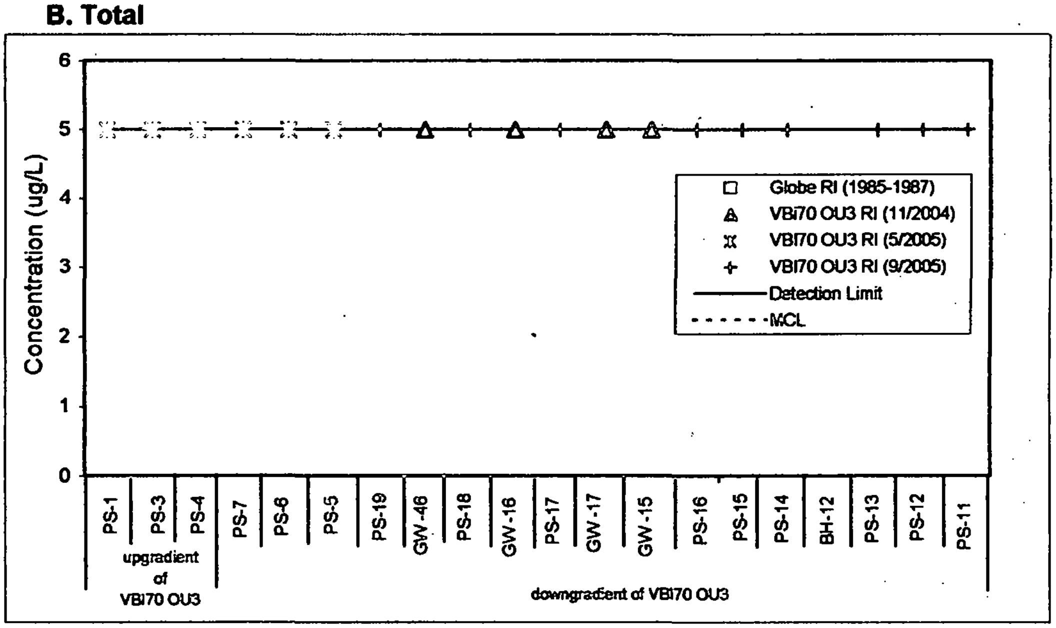
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-19. Spatial and Temporal Distribution of Silver in Off-Site Groundwater

A. Dissolved



B. Total



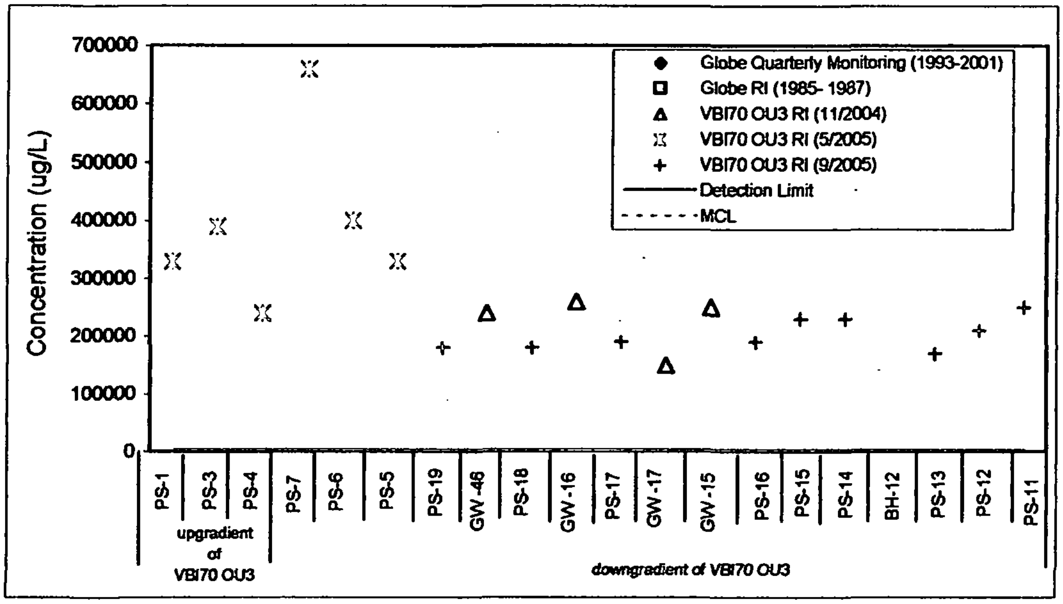
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-20. Spatial and Temporal Distribution of Sodium in Off-Site Groundwater

A. Dissolved



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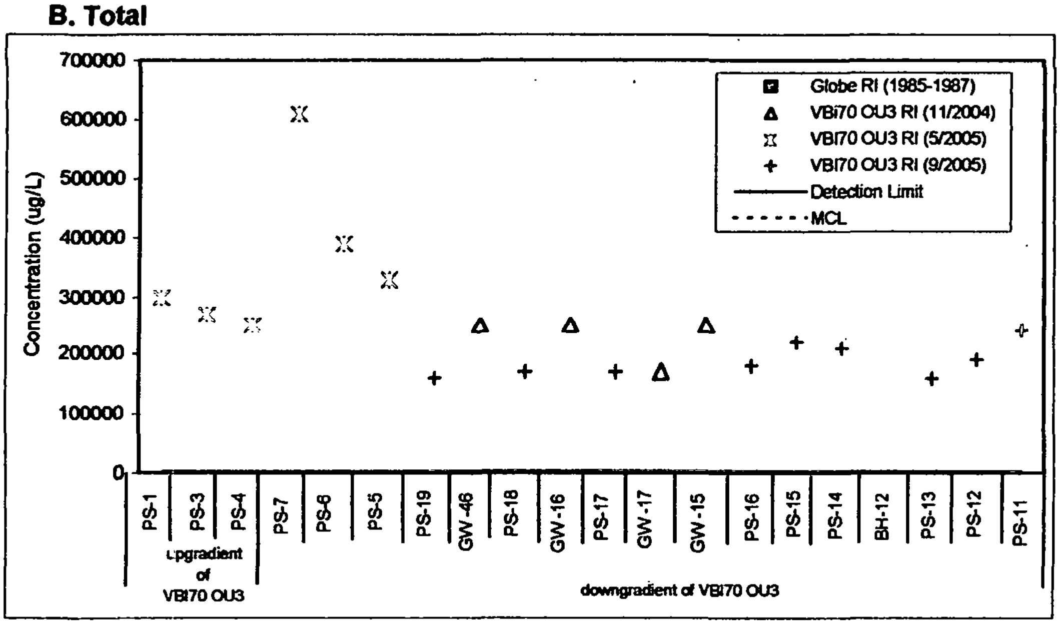


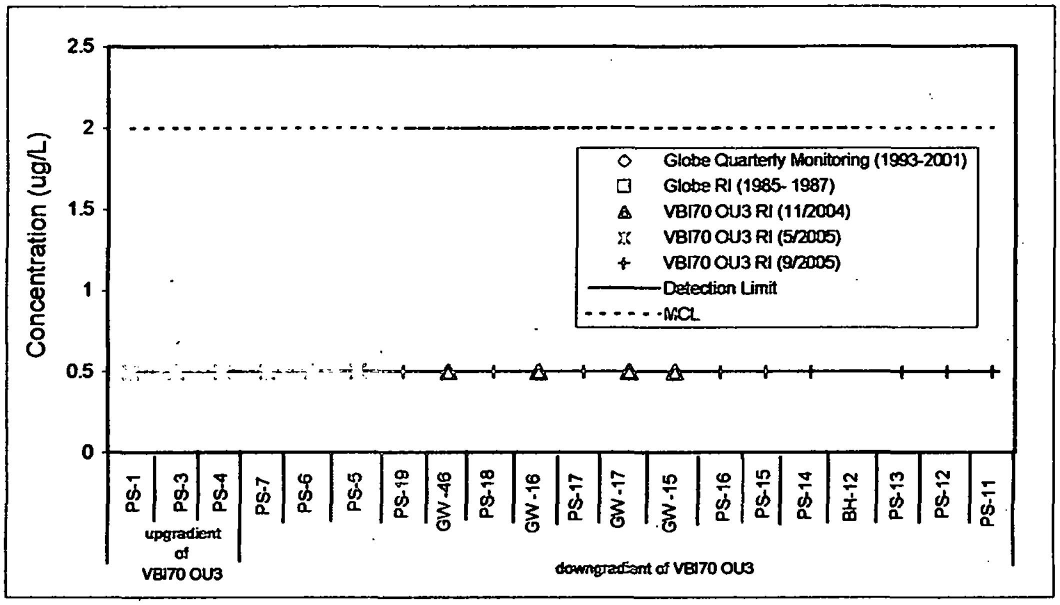
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

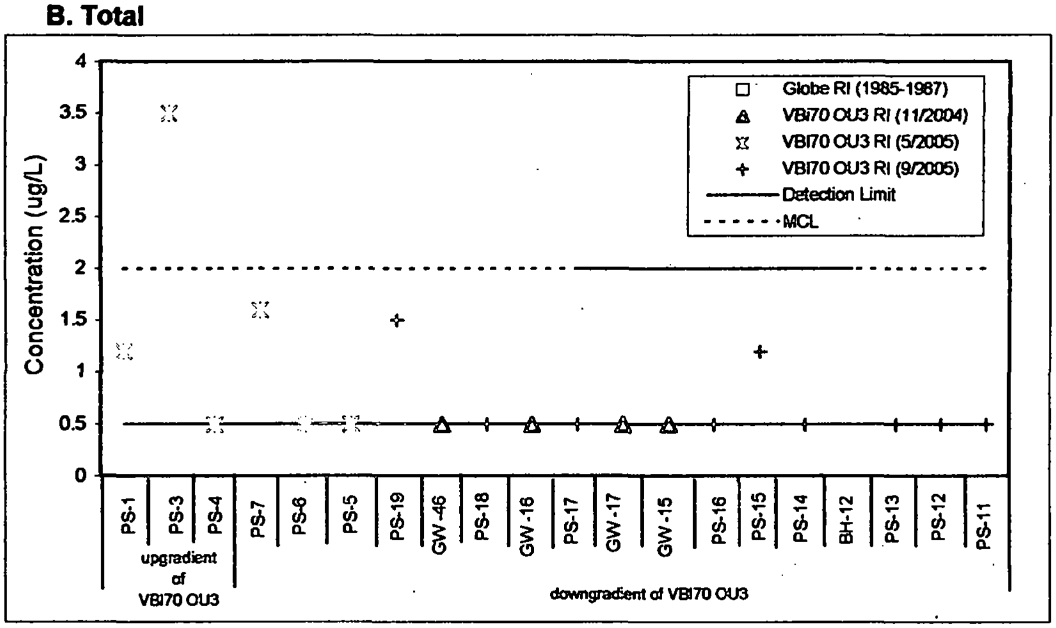
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-21. Spatial and Temporal Distribution of Thallium in Off-Site Groundwater

A. Dissolved



B. Total



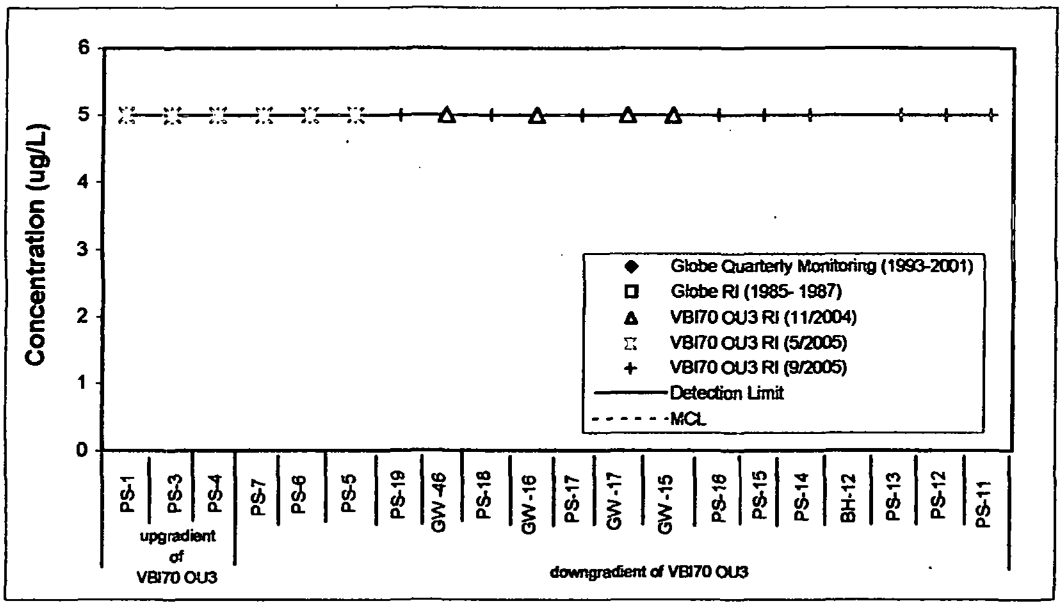
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

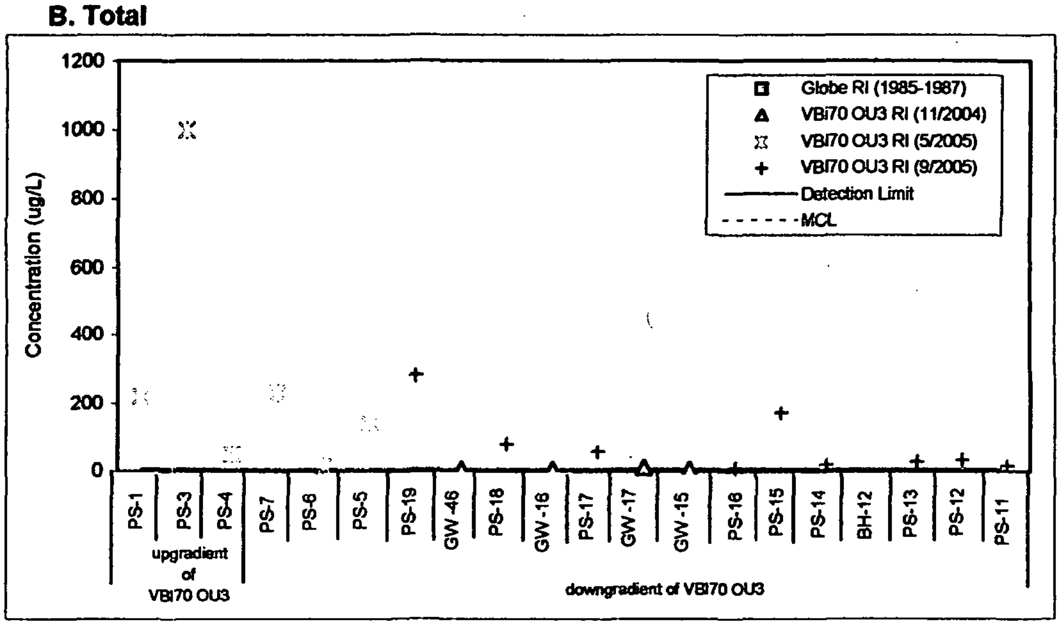
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-22. Spatial and Temporal Distribution of Vanadium in Off-Site Groundwater

A. Dissolved



B. Total



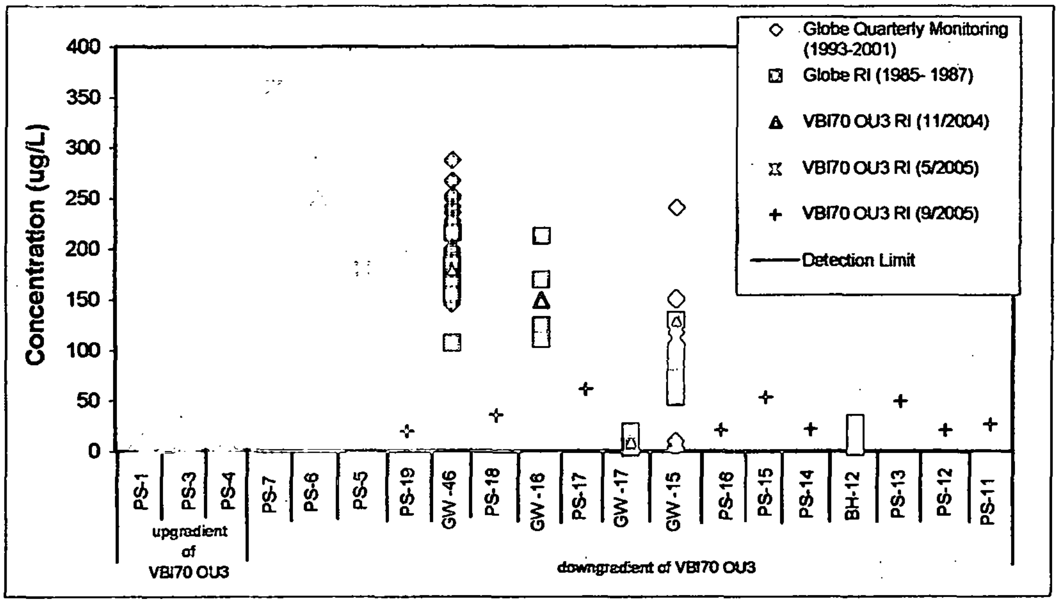
MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

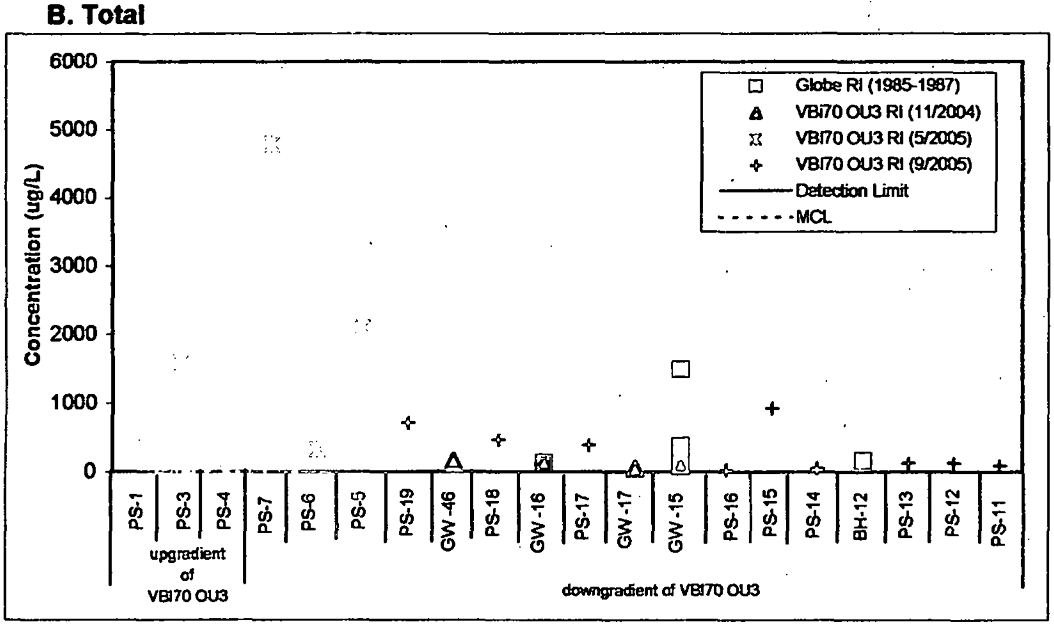
Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

Figure H-23. Spatial and Temporal Distribution of Zinc in Off-Site Groundwater

A. Dissolved



B. Total



MCL = Maximum Contaminant Level

DL = Detection Limit. Concentration values at or below this line are considered non-detect.

Note: different laboratories were used for analysis of Globe Plant Samples and VBI70 OU3 RI Samples, thus detection limits may differ for a chemical.

APPENDIX I

GROUNDWATER MIGRATION

I1 – Influence of I-25 on Groundwater Flow Towards the South Platte River

additional geologic and facility information would provide an explanation for the ground-water flow and cadmium concentrations observed in monitoring wells on both sides of the I-25 corridor north of I-70.

The attached Figure 1 shows on-site and off-site ground-water sampling locations for the Argo Smelter site. The attached Figure 4-13 shows the conceptual model of the shallow ground water as we knew it prior to review of the CDOT As Construction drawings.

The area of I-25/I-70 shown on Figure 1 and Figure 4-13 from approximately the center of the Mousetrap north to 48th Avenue has been highly altered due to highway construction since 1964 to present. Footings for overpasses and most likely the retaining walls are founded on the underlying claystone or sandstone bedrock. Review of the above CDOT drawings indicates that retaining walls on both the west and east sides of I-25 at the 48th Avenue underpass are founded on claystone bedrock. This disruption is evident on Figure 4-13, which shows the disconnected geologic section for I-25 due to the retaining walls. Additionally, there is a retaining wall along the west side of I-25 and the ramp from southbound I-25 to westbound I-70 (south and west of MW-34 in Figure 1), which also appears to be a significant barrier. We have not reviewed specific CDOT drawings for this I-25 to I-70 ramp construction. However, the engineers typically found such structures on bedrock if possible. It is also reasonable to assume that the other connection ramps and bridges between I-70 and I-25 on the north half of the Mousetrap also have their footings and retaining walls founded on bedrock.

My hypothesis is that flow paths in the alluvium and along the alluvium-claystone bedrock interface have been disrupted by the I-25/I-70 facilities. Because ground-water flow in the alluvium and along the alluvium-claystone bedrock interface is typically from west to east from the Argo Smelter area toward the South Platte River, flow paths in the alluvium and along its interface with the claystone are generally cut off at I-25 due to the retaining walls, especially at and just south of 48th Avenue. The extent to which ground-water flow moves north or south of these cut offs to continue towards the South Platte River is unknown.

The CDOT As Constructed drawings also show water pipelines, sanitary sewers pipelines, and irrigation facilities in the vicinity of the Mousetrap. Some of these facilities also may be potential sources of contamination or may remove water from the ground-water system depending on their specific location relative to the water table, their construction (leaky joints), and the source of their liquid.

The Farmers and Gardeners Ditch passes through the Mousetrap in a 36-inch diameter culvert. This ditch diverts South Platte River water at Confluence Park south of the Mousetrap and delivers it to the Xcel Power Plant just south of 64th Avenue and east of I-25. The ditch culvert exits the Mousetrap beneath the ramp from westbound I-70 to northbound I-25. The CDOT drawings did not specify the type of culvert for the ditch. Although the ditch is not currently being used, it could have leaked water into the surrounding soil/rock materials in the past.

A 72-inch sanitary sewer pipeline parallels the Farmers and Gardeners Ditch. As with the ditch culvert, the CDOT drawings are silent on the type of pipeline materials. However, depending on the hydraulics of the pipeline, discharges into or out of this pipeline are possible at joints.

The CDOT plan and profile drawings along I-25 from the Mousetrap to 48th Avenue show numerous crossings beneath I-25 of water pipelines. These pipelines are considered to be unimportant in terms of contaminant sources, but their trenches may form preferential flow paths. The plan and profile drawings also show numerous sanitary sewer pipeline crossings. The pipelines vary from 8-inchs in diameter to 36-inches in diameter. Additionally, large storm sewer pipelines, up to 48-inches in diameter, cross I-25. All these pipeline crossings are from west to east.

The As Constructed drawings at 48th Avenue show storm and sanitary sewer pipelines parallel to I-25, at least on the west side of the interstate highway. We presume that similar facilities also are present on the east side of the highway. All these facilities, depending on their location and source of fluid, may add or subtract water from the surrounding soil materials through their joints. The trenches in which these pipelines are installed may also be preferential pathways for ground-water flow.

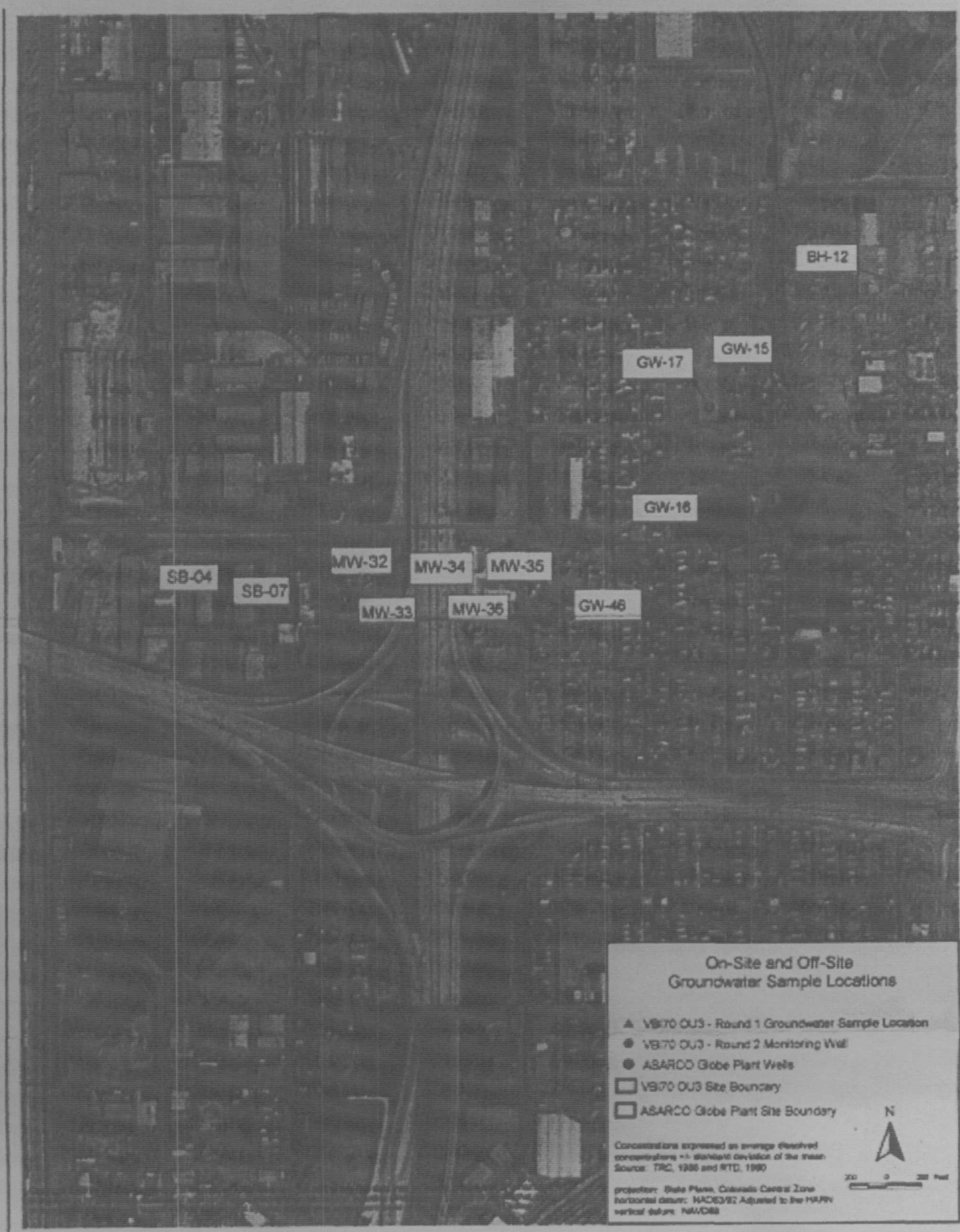
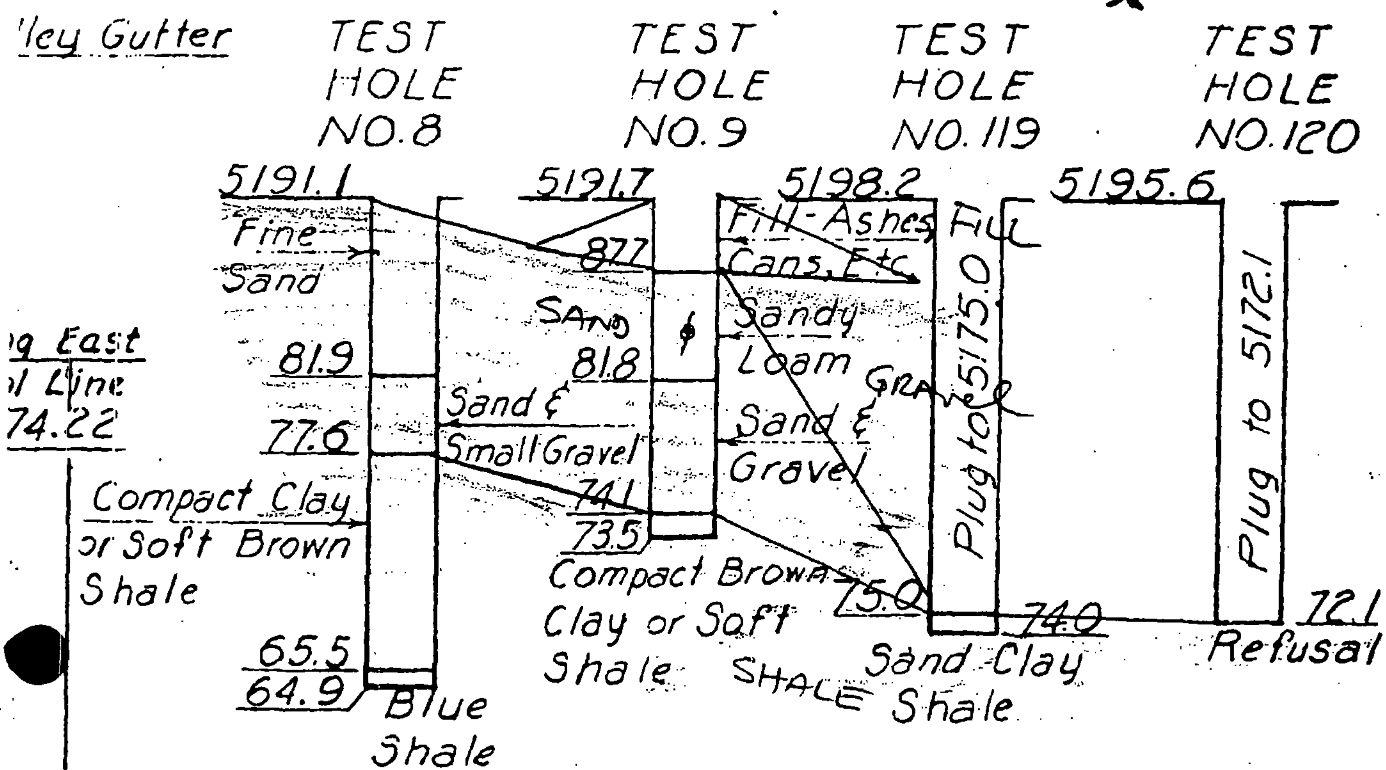

BH-12
GW-17
GW-15
GW-16
SB-04
SB-07
MW-32
MW-34
MW-35
MW-33
MW-36
GW-46
On-Site and Off-Site
Groundwater Sample Locations
VBI70 OU3 - Round 1 Groundwater Sample Location
VBI70 OU3 - Round 2 Monitoring Well
ASARCO Globe Plant Wells
VBI70 OU3 Site Boundary
ASARCO Globe Plant Site Boundary
N

Figure 1

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	I 25-2 (64) 214	12	



LOG OF TEST HOLES

GENERAL NOTES

ALL WORK SHALL BE DONE ACCORDING TO THE STANDARD SPECIFICATIONS OF THE COLORADO DEPARTMENT OF HIGHWAYS APPLICABLE TO THE PROJECT. ALL CONCRETE SHALL BE CLASS "A".

ALL REINFORCING STEEL SHALL BE INTERMEDIATE GRADE STEEL OF A DEFORMED TYPE. EACH BAR SHALL BE TAGGED WITH THE BAR DESIGNATION AND STATION NUMBER OF THE PROJECT.

IF BY PERMISSION OF THE ENGINEER PRIMARY BARS ARE SPLICED, THEY SHALL LAP A MINIMUM OF 28 DIAMETERS FOR BARS NEAR TOPS OF BEAMS HAVING MORE THAN 12 INCHES OF CONCRETE UNDER THE BARS, AND 17 DIAMETERS FOR BARS NEAR BOTTOM OF MEMBERS. SECONDARY BARS WHEN SPLICED SHALL LAP 17 DIAMETERS OF THE BAR.

DIMENSIONS FOR REINFORCING STEEL NOT SHOWN AS CLEAR SHALL BE TO THE CENTERLINE OF THE BAR.

SOUNDINGS AND DEPTH OF FOOTINGS ARE IN ACCORDANCE WITH THE BEST AVAILABLE DATA, AND WHEN DIFFERENT CONDITIONS ARE ENCOUNTERED THE BRIDGE ENGINEER WILL INSPECT AND DETERMINE IF REDESIGN IS NECESSARY.

FOOTINGS IN ROCK SHALL BE POURED OUT TO ROCK AND NOT FORMED.

WHEN EXCAVATING FOR FOOTINGS THE FINAL ONE FOOT IN DEPTH SHALL BE DONE BY HANDLABOR METHODS.

FOR DETAILS OF STRUCTURAL EXCAVATION AND STRUCTURE BACKFILL, SEE STANDARD M-16-A.

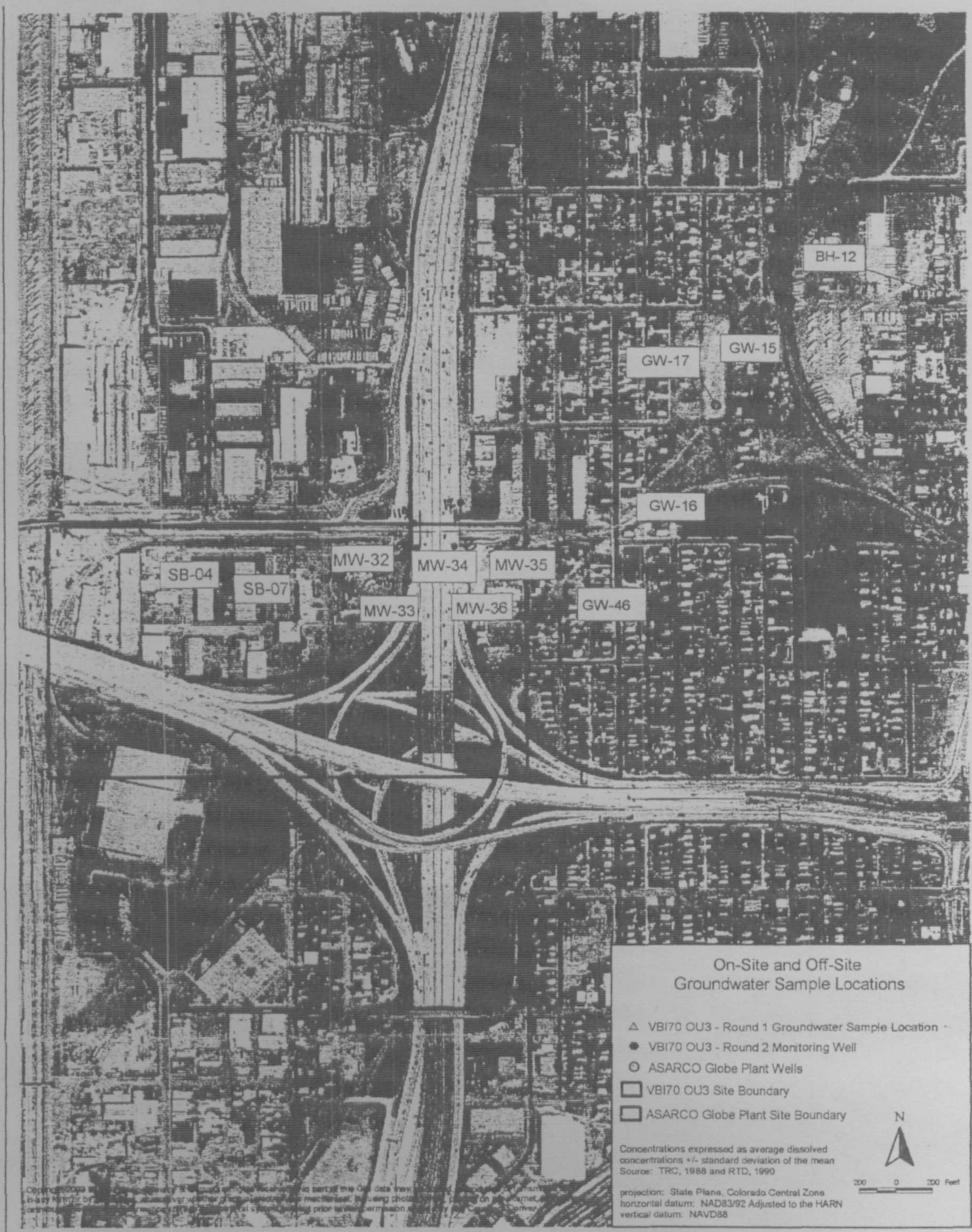
WELDING SHALL CONFORM TO THE LATEST EDITION OF THE A.W.S. STANDARD SPECIFICATIONS FOR WELDING HIGHWAY BRIDGES.

ALL DIMENSIONS AND ELEVATIONS RELATIVE TO THE EXISTING STRUCTURE ARE BASED ON THE ORIGINAL CONSTRUCTION PLANS OF THE EXISTING STRUCTURE AND SHALL BE CHECKED IN THE FIELD BY THE BRIDGE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION.

ALL CONCRETE SURFACES MARKED WITH THE SYMBOL f AS SHOWN ON SHEET NO. 72 SHALL RECEIVE CLASS "1" SURFACE FINISH.

E-16-EH/ER

QUANTITIES



MP 213.62 - 213.74

Figure 1

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

PLAN AND PROFILE OF PROPOSED FEDERAL AID PROJECT NO.
I 25-2(64)214
I 70-3(30)284

STATE HIGHWAY NO. 185 & 72
CITY & COUNTY OF DENVER

SCALES OF ORIGINAL DRAWINGS
ON PLAN, 1 IN. = 50 FT.
ON PROFILE, 1 IN. = 50 FT. HORIZONTAL; 1 IN. = 10 FT. VERTICAL
GRADE LINE ON PROFILE IS SHOWN AS GRADE OF FINISHED ROAD
GROSS LENGTH OF PROJECT: I 25-2(64)214 = 2,855.90 Ft. = 0.541 Mi.; I 70-3(30)284 = 4,141.42 Ft. = 0.784 Mi.
NET LENGTH OF PROJECT

DISTRICT ENGINEER

CONVENTIONAL SIGNS

CENTER LINE
RIGHT OF WAY LINE
COUNTY LINE
TOWNSHIP OR RANGE LINE
LAND LINES
RAILROAD
BARBED WIRE FENCE
COMBINATION WIRE FENCE
SNOW FENCE
TELEPHONE & TELEGRAPH LINES
POWER LINES
DETOUR
PRESENT ROAD (Plan Sheets)
C. OF A. LINE (CONTROL OF ACCESS)
ACCESS POINTS (FREEWAY)
ACCESS DENIED BY DEED
FRONTAGE ROAD (PRESENT CONST.)
FRONTAGE ROAD (FUTURE CONST.)

FED. ROAD DIV. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	I 25-2(64)214 I 70-3(30)284	1	168

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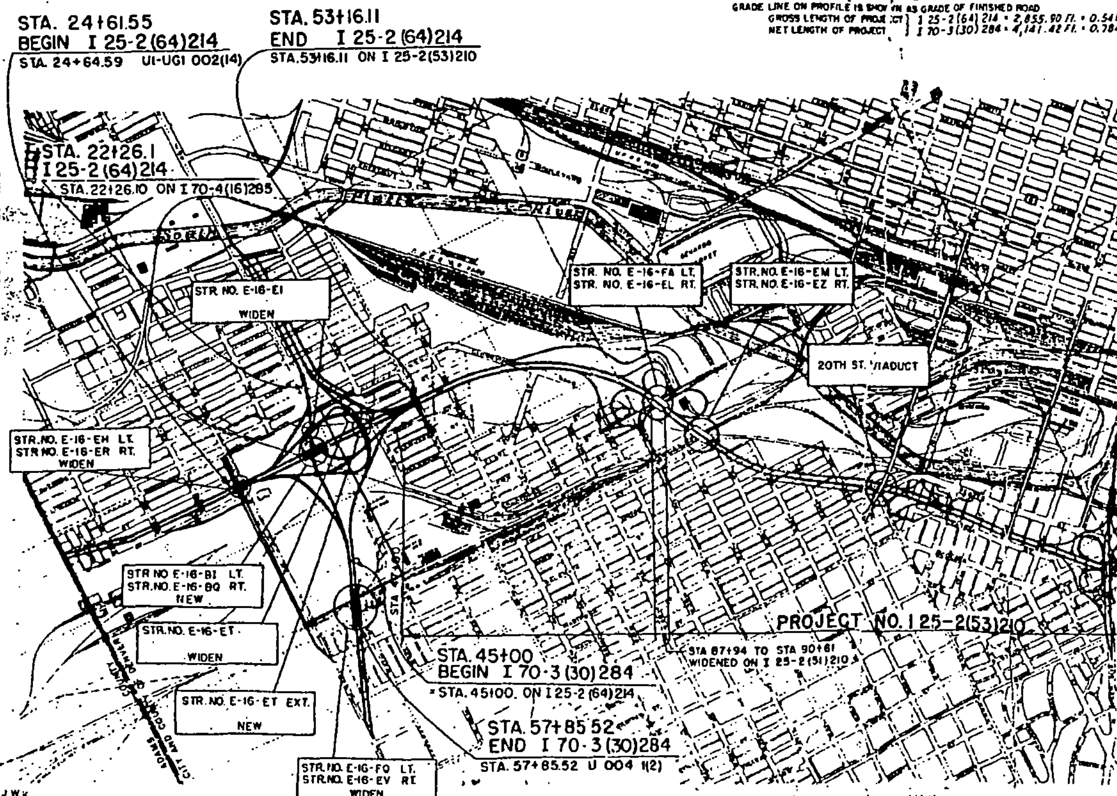
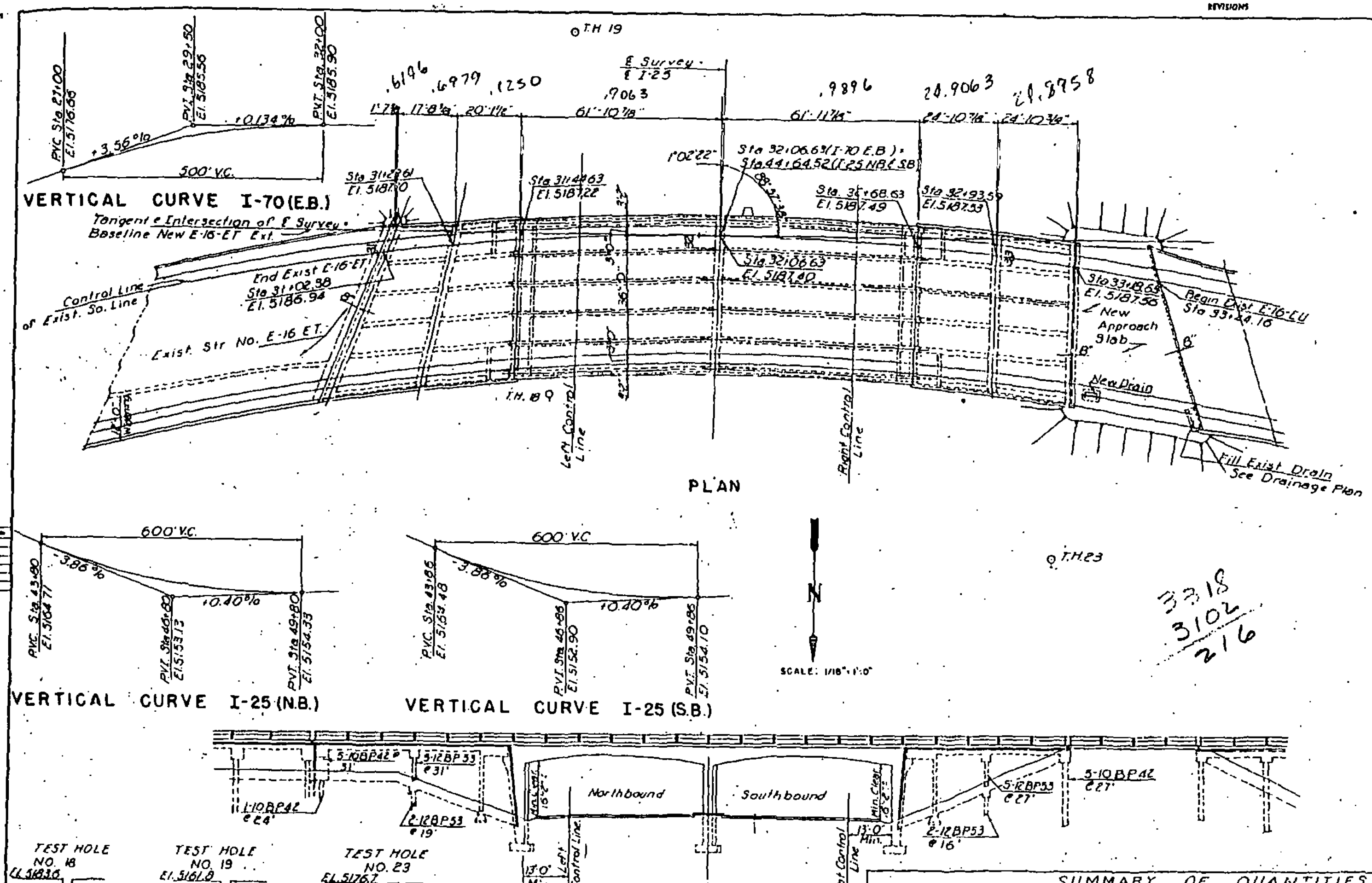
SEE SPECIAL PROVISIONS FOR NOTICE TO BIDDERS

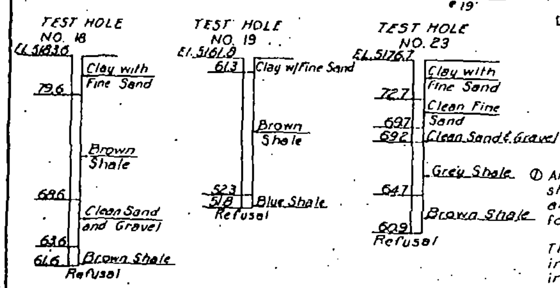
COLORADO DEPARTMENT OF HIGHWAYS
APPROVED: [signature] CHIEF ENGINEER 4/23/64 DATE

DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
APPROVED: ____ DATE
DIVISION ENGINEER



CITY AND COUNTY OF
DENVER
STATE OF COLORADO





LOG OF TEST HOLES

NOTES:
① All Expansion Joint and Joint Filler Material shall conform to AASHO Spec. M-153-54 and shall be included in the bid price for Class "A" Concrete.

The Approach Slab quantities are not included in the Bridge Quantities, but are included in the Roadway Quantities.

Quantities for Str. No. E-16-EU are included in the Total Quantities for Str. No. E-16-ET Extension.

REVISIONS

FED. ROAD DIV. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	I 25-2 (64)214	49	

GENERAL NOTES

ALL WORK SHALL BE DONE ACCORDING TO THE STANDARD SPECIFICATIONS OF THE COLORADO DEPARTMENT OF HIGHWAYS APPLICABLE TO THE PROJECT. ALL CONCRETE SHALL BE CLASS "A".

ALL REINFORCING STEEL SHALL BE INTERMEDIATE GRADE STEEL OF A DEFORMED TYPE. EACH BAR SHALL BE TAGGED WITH THE BAR DESIGNATION AND STATION NUMBER OF THE PROJECT.

IF BY PERMISSION OF THE ENGINEER PRIMARY BARS ARE SPLICED, THEY SHALL LAP A MINIMUM OF [illegible] DIAMETERS FOR BARS NEAR TOPS OF BEAMS HAVING MORE THAN 12 INCHES OF CONCRETE UNDER THE BARS, AND [illegible] DIAMETERS FOR BARS NEAR BOTTOM OF MEMBERS. SECONDARY BARS WHEN SPLICED SHALL LAP [illegible] DIAMETERS OF THE BAR.

DIMENSIONS FOR REINFORCING STEEL NOT SHOWN AS CLEAR SHALL BE TO THE CENTERLINE OF THE BAR.

SOUNDINGS AND DEPTH OF FOOTINGS ARE IN ACCORDANCE WITH THE BEST AVAILABLE DATA, AND WHEN DIFFERENT CONDITIONS ARE ENCOUNTERED THE BRIDGE ENGINEER WILL INSPECT AND DETERMINE IF REVISION IS NECESSARY.

FOOTINGS IN ROCK SHALL BE POURED OUT TO ROCK AND NOT FORMED.

WHEN EXCAVATING FOR FOOTINGS THE FINAL ONE FOOT IN DEPTH SHALL BE DONE BY HAND-LABOR METHODS.

FOR DETAILS OF STRUCTURAL EXCAVATION AND STRUCTURE BACKFILL, SEE STANDARD M-10-A. ALL CONCRETE SURFACES MARKED WITH THE SYMBOL ƒ AS SHOWN ON SHEET NO. 72 SHALL RECEIVE CLASS "1" SURFACE FINISH.

ALL STRUCTURAL STEEL SHALL BE PAINTED WITH ONE SHOP COAT OF ZINC CHROMATE AND TWO FIELD COATS OF ALUMINUM PAINT UNLESS OTHERWISE NOTED.

ALL RIVETS SHALL BE 3/4 INCH DIAMETER UNLESS OTHERWISE NOTED.

HIGH TENSILE BOLTS MAY BE SUBSTITUTED FOR FIELD RIVETS AT THE CONTRACTORS OPTION. BOLTS SHALL BE FURNISHED IN THE AMOUNT OF FIVE PERCENT IN EXCESS OF THE NOMINAL NUMBER REQUIRED FOR EACH SIZE AND LENGTH.

WELDING SHALL CONFORM TO THE LATEST EDITION OF THE A.W.S. STANDARD SPECIFICATIONS FOR WELDING HIGHWAY BRIDGES.

FOR WELDED GIRDERS ALL SHOP BUTT WELDS IN FLANGES AND WEBS SHALL BE MADE BEFORE WELDING INTO GIRDER.

WHEN CALLED FOR IN THE SPECIAL PROVISIONS, SHOP WELDS SHALL BE INSPECTED RADIOGRAPHICALLY AND BY THE PENETRANT DYE METHOD.

WHEN TREATED TIMBER PILING IS SHOWN ON THE PLANS, THE PRESERVATIVE FOR TREATMENT SHALL BE CREOSOTE OIL.

ALL DIMENSIONS AND ELEVATIONS RELATIVE TO THE EXISTING STRUCTURE ARE BASED ON THE ORIGINAL CONSTRUCTION PLANS OF THE EXISTING STRUCTURE AND SHALL BE CHECKED IN THE FIELD BY THE BRIDGE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION.

LOADING DATA.
LIVE LOAD = H20-S16-44 A.A.S.H.O. Specs. & Interstate Alternate Loading, 1961 Specs.
DEAD LOAD = Assumes 25 Lbs. per sq. ft. additional wearing surface.

DESIGNING DATA.
A.A.S.H.O. UNIT STRESSES
fc = 1,200 Lbs. per sq. in.
fs = 20,000 Lbs. per sq. in. (Reinf.)
n = 10

SUMMARY OF QUANTITIES

Item	Description	Units	E. Abut.	Frame	W. Abut.	Appr. Slab	E-16-EU	Total
11	Rem. of Portions of Present Structure	Each	—	—	—	—	1	1
14	Uncl. Str. Excav.-Bridges	Cu.Yd.	54	86	75			215
16	Str. Backfill (Class 1)	Cu.Yd.	37	39	44			120
37	Concrete Pavement (10)	Sq.Yd.				175		
46	Class "A" Concrete	Cu.Yd.	208.3	333.4	195.8		1.2	939.7
47	Reinforcing Steel	Lbs.	39,030	120,630	36,190	8,110		195,850
61	Steel Piling (10 BP 42)	Lin.Ft.	179		135			† 314
61	Steel Piling (12 BP 53)	Lin.Ft.	193		167			‡ 360
84	Curb (Variable)	Lin.Ft.				65		
90	1½" Elec. Cond. with Jct'n. Boxes	Lin.Ft.	50	202	55			307
11	Reset Steel Railing	Lin.Ft.	101	248	100	64	43	492
①	½" Joint Filler (Type I)	Sq.Ft.	40	40	51		69	200
①	1" Joint Filler (Type I)	Sq.Ft.	56					56

† Includes 5 @ 31'; 5 @ 27' & 1 @ 24'
‡ Includes 5 @ 31'; 5 @ 27'; 2 @ 19' & 2 @ 16'

BRIDGE EXTENSION
STRUCTURE NO. E-16-ET Extension

PLANS PREPARED BY:
DUROWTH AND MARTIN
Consulting Engineers
[illegible] Denver, Colorado

COLORADO
DEPARTMENT OF HIGHWAYS
46TH AVENUE INTERCHANGE
I-70 (E.B.)

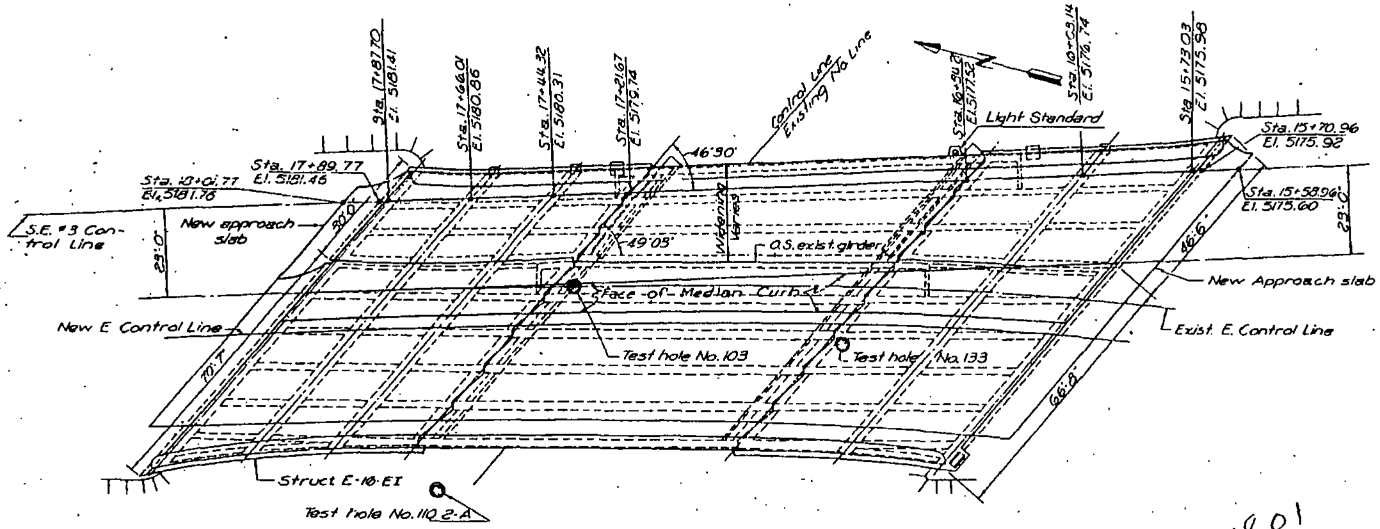
GENERAL PLAN AND ELEVATION

Across I-25 (N.B.) & (S.B.)
Sta. 32+06.63
Near ______ Sec. 22 T. 3S. R. 68 W.

Designed by JGF Made by KLK Checked by JGF	Approved by Bridge Engineer Date: 19

REVISIONS

FED. ROAD DIV. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	I 25-2 (64)214	21	



PLAN

1801
1573
228

GENERAL NOTES

ALL WORK SHALL BE DONE ACCORDING TO THE STANDARD SPECIFICATIONS OF THE COLORADO DEPARTMENT OF HIGHWAYS APPLICABLE TO THE PROJECT. ALL CONCRETE SHALL BE CLASS "A".

ALL REINFORCING STEEL SHALL BE INTERMEDIATE GRADE STEEL OF A DEFORMED TYPE. EACH BAR SHALL BE TAGGED WITH THE BAR DESIGNATION AND STATION NUMBER OF THE PROJECT.

IF BY PERMISSION OF THE ENGINEER PRIMARY BARS ARE SPLICED, THEY SHALL LAP A MINIMUM OF 28 DIAMETERS FOR BARS NEAR TOPS OF BEAMS HAVING MORE THAN 12 INCHES OF CONCRETE UNDER THE BARS, AND 17 DIAMETERS FOR BARS NEAR BOTTOM OF MEMBERS. SECONDARY BARS WHEN SPLICED SHALL LAP 17 DIAMETERS OF THE BAR.

DIMENSIONS FOR REINFORCING STEEL NOT SHOWN AS CLEAR SHALL BE TO THE CENTERLINE OF THE BAR.

SOUNDINGS AND DEPTH OF FOOTINGS ARE IN ACCORDANCE WITH THE BEST AVAILABLE DATA, AND WHEN DIFFERENT CONDITIONS ARE ENCOUNTERED THE BRIDGE ENGINEER WILL INSPECT AND DETERMINE IF REDESIGN IS NECESSARY.

FOOTINGS IN ROCK SHALL BE POURED OUT TO ROCK AND NOT FORMED.

WHEN EXCAVATING FOR FOOTINGS THE FINAL ONE FOOT IN DEPTH SHALL BE DONE BY HAND-LABOR METHODS.

FOR DETAILS OF STRUCTURAL EXCAVATION AND STRUCTURE BACKFILL, SEE STANDARD M-16-A. ALL CONCRETE SURFACES MARKED WITH THE SYMBOL (AS SHOWN ON SHEET NO. 72 SHALL RECEIVE CLASS "1" SURFACE FINISH.

ALL STRUCTURAL STEEL SHALL BE PAINTED WITH ONE SHOP COAT OF ZINC CHROMATE AND TWO FIELD COATS OF ALUMINUM PAINT UNLESS OTHERWISE NOTED.

ALL RIVETS SHALL BE 3/4 INCH DIAMETER UNLESS OTHERWISE NOTED.

HIGH TENSILE BOLTS MAY BE SUBSTITUTED FOR FIELD RIVETS AT THE CONTRACTORS OPTION. BOLTS SHALL BE FURNISHED IN THE AMOUNT OF FIVE PERCENT IN EXCESS OF THE NOMINAL NUMBER REQUIRED FOR EACH SIZE AND LENGTH.

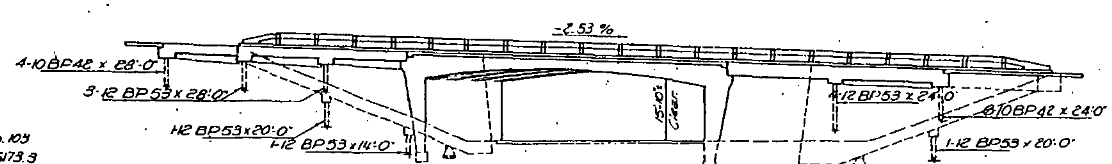
WELDING SHALL CONFORM TO THE LATEST EDITION OF THE A.W.S. STANDARD SPECIFICATIONS FOR WELDING HIGHWAY BRIDGES.

FOR WELDED GIRDERS ALL SHOP BUTT WELDS IN FLANGES AND WEBS SHALL BE MADE BEFORE WELDING INTO GIRDER.

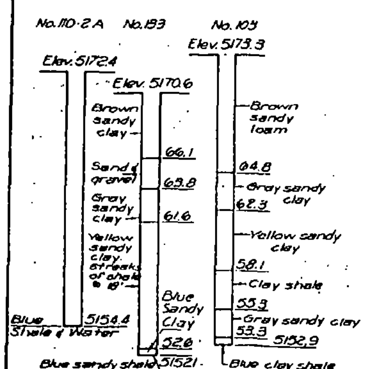
WHEN CALLED FOR IN THE SPECIAL PROVISIONS, SHOP WELDS SHALL BE INSPECTED RADIOGRAPHICALLY AND BY THE PENETRANT DYE METHOD.

WHEN TREATED TIMBER PILING IS SHOWN ON THE PLANS, THE PRESERVATIVE FOR TREATMENT SHALL BE CREOSOTE OIL.

ALL DIMENSIONS AND ELEVATIONS RELATIVE TO THE EXISTING STRUCTURE ARE BASED ON THE ORIGINAL CONSTRUCTION PLANS OF THE EXISTING STRUCTURE AND SHALL BE CHECKED IN THE FIELD BY THE BRIDGE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION.



ELEVATION



LOG OF TEST HOLES

① All Expansion Joint and Joint Filler Material shall conform to AASHO Spec. M-153-54 and shall be included in the bid price for Class A Concrete.

Note: The Approach Slab quantities are not included in the Bridge Quantities, but are included in the Roadway Quantities.

SUMMARY OF QUANTITIES							
Item	Description	Unit	No. Abut.	Frame	So. Abut.	App. Slab	Total
11	Rem. Portions of Present Structure	Each					1
14	Uncl. Str. Excav. - Bridges	Cu.Yd.	40	124	49		213
16	Str. Backfill (Class 1)	Cu.Yd.	22	77	26		125
46	Class 'A' Conc.	Cu.Yd.	133.6	248.3	156.5		538.4
47	Reinf. Steel	lb.	21,980	56,035	29,015	3,660	107030
61	Stl. Piling (10 BP 42)	Lin.Ft.	112		144		† 256
61	Stl. Piling (12 BP 53)	Lin.Ft.	202		116		‡ 318
90	1½" Elec. Cond. with Jctn Box	Lin.Ft.	148	183	145		476
11	Reset Stl. Railing	Lin.Ft.	64	88	63		215
37	Concrete Pavement (10)	Sq.Yd.				83	
①	½" Joint Filler (Type I)	Sq.Ft.	32	25	56		113

†Includes: 4@28' & 6@24'

‡Includes: 6@28', 4@24', 2@20 & 1@14'

LOADING DATA.
LIVE LOAD = H20-S16-44 A.A.S.H.O.
Interstate Alternate Loading

DEAD LOAD = Assumes 25 Lbs. per sq. ft. additional wearing surface.

DESIGNING DATA.
A.A.S.H.O. UNIT STRESSES
fc = 1,200 Lbs. per sq. in.
fs = 20,000 Lbs. per sq. in. (Reinf.)
n = 10

BRIDGE WIDENING

STRUCTURE NO. E-16-EI

PLANS PREPARED BY:
BURGWIN AND MARTIN
Consulting Engineers
Denver Colorado

COLORADO
DEPARTMENT OF HIGHWAYS
46TH AVENUE INTERCHANGE
S.E. # 3 & EAST LINE

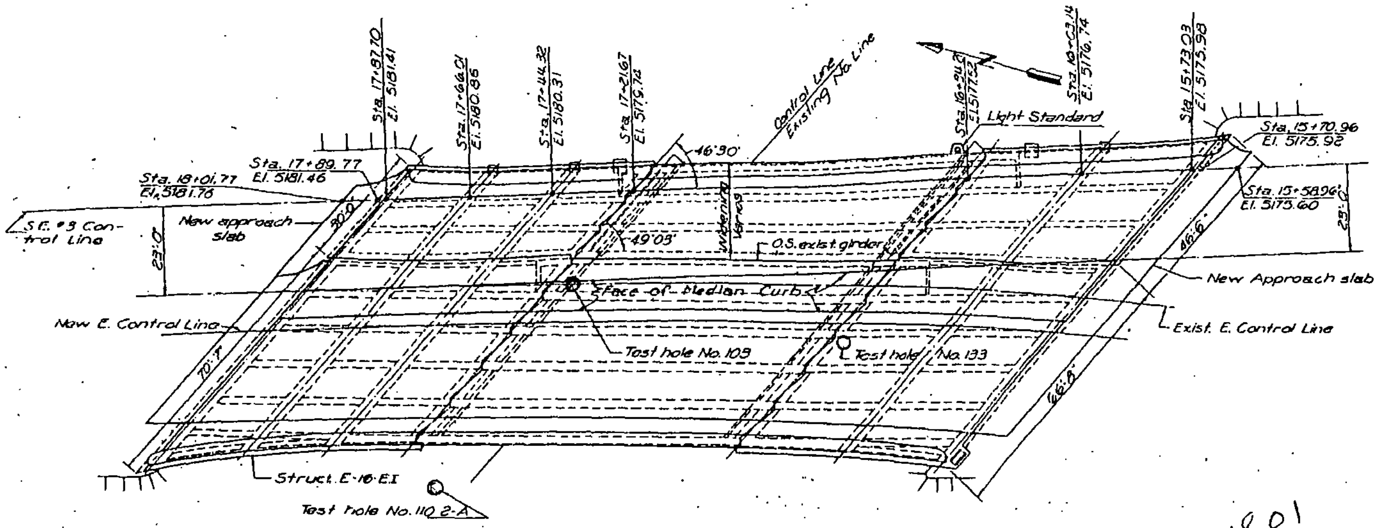
GENERAL PLAN & ELEVATION

Across I-70 (W.B.)
Sta.
Near Sec. T. R.

Designed by WWD	Approved by Bridge Engineer
Made by W.B.N.	
Checked by WWD	Date: 19

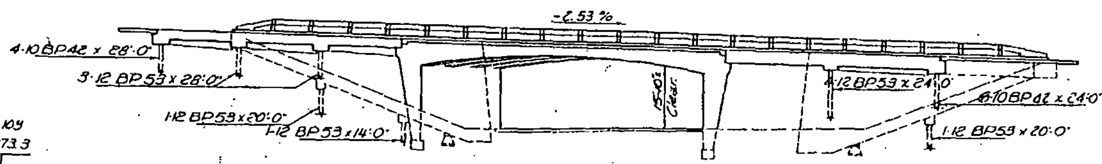
REVISIONS

FED. ROAD DIV. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	I 25-2 (64) 214	21	

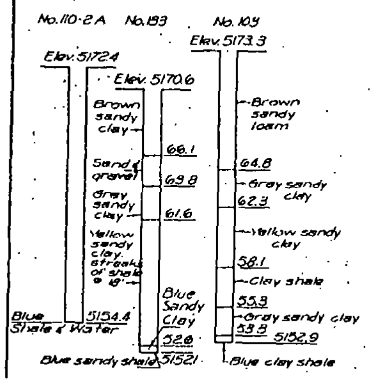


PLAN

1801
1573
228



ELEVATION



GENERAL NOTES

ALL WORK SHALL BE DONE ACCORDING TO THE STANDARD SPECIFICATIONS OF THE COLORADO DEPARTMENT OF HIGHWAYS APPLICABLE TO THE PROJECT. ALL CONCRETE SHALL BE CLASS "A".

ALL REINFORCING STEEL SHALL BE INTERMEDIATE GRADE STEEL OF A DEFORMED TYPE. EACH BAR SHALL BE TAGGED WITH THE BAR DESIGNATION AND STATION NUMBER OF THE PROJECT.

IF BY PERMISSION OF THE ENGINEER PRIMARY BARS ARE SPLICED, THEY SHALL LAP A MINIMUM OF 33 DIAMETERS FOR BARS NEAR TOPS OF BEAMS HAVING MORE THAN 12 INCHES OF CONCRETE UNDER THE BARS, AND 17 DIAMETERS FOR BARS NEAR BOTTOM OF MEMBERS. SECONDARY BARS WHEN SPLICED SHALL LAP 17 DIAMETERS OF THE BAR.

DIMENSIONS FOR REINFORCING STEEL NOT SHOWN AS CLEAR SHALL BE TO THE CENTERLINE OF THE BAR.

SOUNDINGS AND DEPTH OF FOOTINGS ARE IN ACCORDANCE WITH THE BEST AVAILABLE DATA, AND WHEN DIFFERENT CONDITIONS ARE ENCOUNTERED THE BRIDGE ENGINEER WILL INSPECT AND DETERMINE IF REDESIGN IS NECESSARY.

FOOTINGS IN ROCK SHALL BE POURED OUT TO ROCK AND NOT FORMED.

WHEN EXCAVATING FOR FOOTINGS THE FINAL ONE FOOT IN DEPTH SHALL BE DONE BY HAND-LABOR METHODS.

FOR DETAILS OF STRUCTURAL EXCAVATION AND STRUCTURE BACKFILL, SEE STANDARD M-11-A. ALL CONCRETE SURFACES MARKED WITH THE SYMBOL Ⓢ AS SHOWN ON SHEET NO. 72 SHALL RECEIVE CLASS "1" SURFACE FINISH.

ALL STRUCTURAL STEEL SHALL BE PAINTED WITH ONE SHOP COAT OF ZINC CHROMATE AND TWO FIELD COATS OF ALUMINUM PAINT UNLESS OTHERWISE NOTED.

ALL RIVETS SHALL BE 3/4 INCH DIAMETER UNLESS OTHERWISE NOTED.

HIGH TENSILE BOLTS MAY BE SUBSTITUTED FOR FIELD RIVETS AT THE CONTRACTORS OPTION. BOLTS SHALL BE FURNISHED IN THE AMOUNT OF FIVE PERCENT IN EXCESS OF THE NOMINAL NUMBER REQUIRED FOR EACH SIZE AND LENGTH.

WELDING SHALL CONFORM TO THE LATEST EDITION OF THE A.W.S. STANDARD SPECIFICATIONS FOR WELDED HIGHWAY BRIDGES.

FOR WELDED GIRDERS ALL SHOP BUTT WELDS IN FLANGES AND WEBS SHALL BE MADE BEFORE WELDING INTO GIRDER.

WHEN CALLED FOR IN THE SPECIAL PROVISIONS, SHOP WELDS SHALL BE INSPECTED RADIOGRAPHICALLY AND BY THE PENETRANT DYE METHOD.

WHEN TREATED TIMBER PILING IS SHOWN ON THE PLANS, THE PRESERVATIVE FOR TREATMENT SHALL BE CREOSOTE OIL.

ALL DIMENSIONS AND ELEVATIONS RELATIVE TO THE EXISTING STRUCTURE ARE BASED ON THE ORIGINAL CONSTRUCTION PLANS OF THE EXISTING STRUCTURE AND SHALL BE CHECKED IN THE FIELD BY THE BRIDGE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION.

① All Expansion Joint and Joint Filler Material shall conform to AASHO Spec. M-153-54, and shall be included in the bid price for Class A Concrete.

Note: The Approach Slab quantities are not included in the Bridge Quantities, but are included in the Roadway Quantities.

SUMMARY OF QUANTITIES

Item	Description	Unit	No. Abut.	Frame	So. Abut.	App. Slab	Total
11	Rem. Portions of Present Structure	Each					1
14	Uncl. Str. Excav. - Bridges	Cu. Yd.	40	124	49		213
16	Str. Backfill (Class 1)	Cu. Yd.	22	77	26		125
46	Class "A" Conc.	Cu. Yd.	133.6	248.3	156.5		538.4
47	Reinf. Steel	lb.	21,980	56,035	29,015	3,660	107,030
61	Stl. Piling (10 BP 42)	Lin. Ft.	112		144		† 256
61	Stl. Piling (12 BP 53)	Lin. Ft.	202		116		‡ 318
90	1½" Elec. Cond. with Jctn Box	Lin. Ft.	148	183	145		476
11	Reset Stl. Railing	Lin. Ft.	64	88	63		215
37	Concrete Pavement (10")	Sq. Yd.				83	

† Includes: 4 @ 28' & 6 @ 24'.
‡ Includes: 6 @ 28', 4 @ 24', 2 @ 20 & 1 @ 14'

LOADING DATA.
LIVE LOAD = H20-S16-44 A.A.S.H.O. Interstate Alternate Loading

DEAD LOAD = Assumes 25 Lbs. per sq. ft. additional wearing surface.

DESIGNING DATA.
A.A.S.H.O. UNIT STRESSES
fc = 1,200 Lbs. per sq. in.
fs = 20,000 Lbs. per sq. in. (Reinf.)
n = 10

BRIDGE WIDENING

STRUCTURE NO. E-18-EI

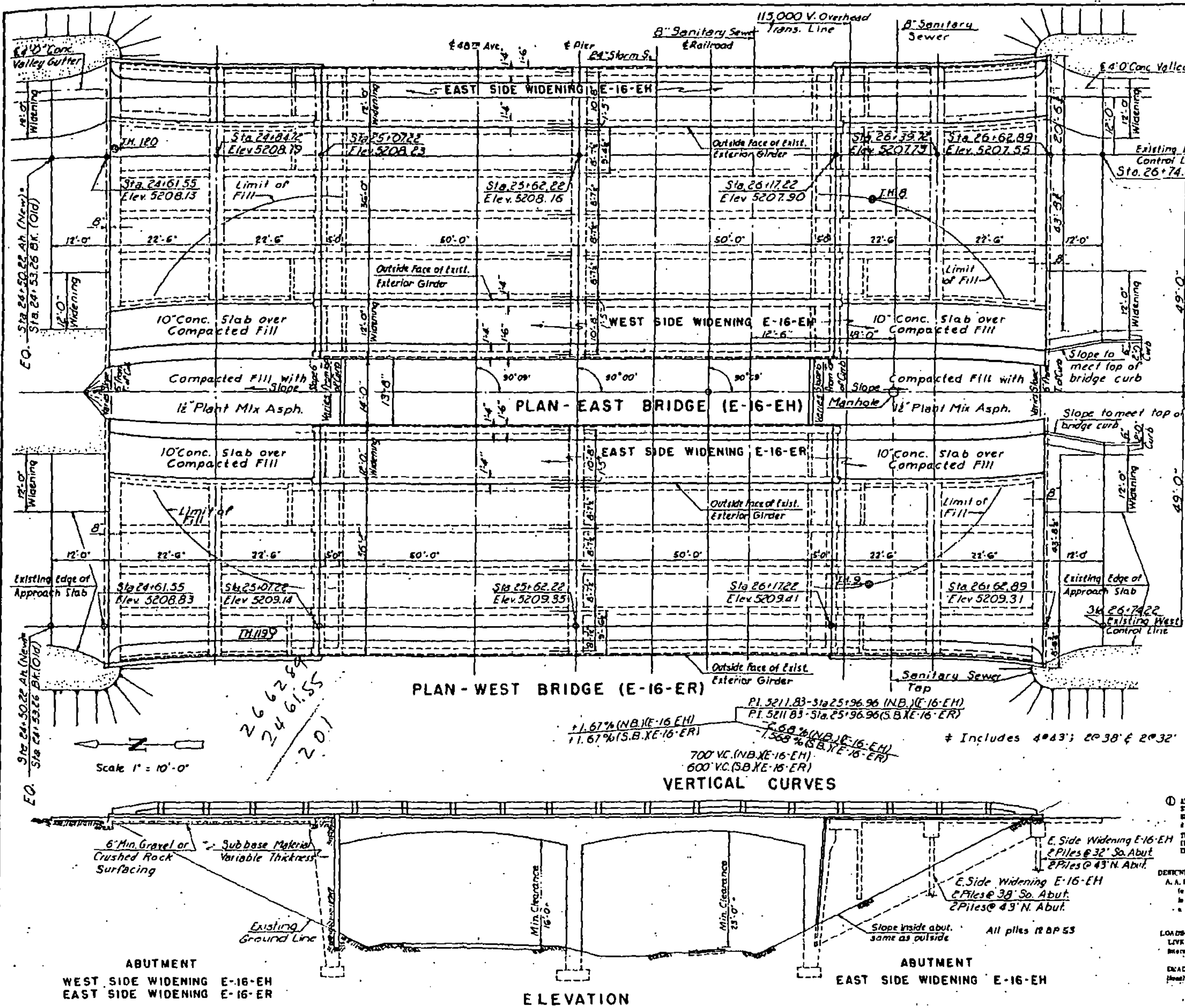
PLANS PREPARED BY:
BURGWIN AND MARTIN
Consulting Engineers
Denver Colorado

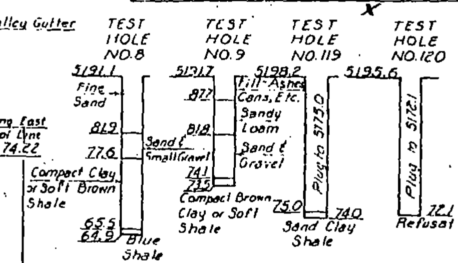
COLORADO
DEPARTMENT OF HIGHWAYS
46 TH AVENUE INTERCHANGE
S.E. # 3 & EAST LINE
GENERAL PLAN
& ELEVATION

Across I-70 (W.B.)
Sta.
Near Sec. T. R.
Designed by WWD | Approved by
Made by W.R.N. | Bridge Engineer
Checked by WWD | Date: 19

REVISIONS

FED. ROAD DIV. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	I 25-2 (64) 214	12	





LOG OF TEST HOLES

GENERAL NOTES

ALL WORK SHALL BE DONE ACCORDING TO THE STANDARD SPECIFICATIONS OF THE COLORADO DEPARTMENT OF HIGHWAYS APPLICABLE TO THE PROJECT. ALL CONCRETE SHALL BE CLASS "A".
ALL REINFORCING STEEL SHALL BE INTERMEDIATE GRADE STEEL OF A DEFORMED TYPE. EACH BAR SHALL BE TAGGED WITH THE BAR DESIGNATION AND STATION NUMBER OF THE PROJECT.
IF BY PERMISSION OF THE ENGINEER PRIMARY BARS ARE SPLICED, THEY SHALL LAP A MINIMUM OF 28 DIAMETERS FOR BARS NEAR TOPS OF BEAMS HAVING MORE THAN 12 INCHES OF CONCRETE UNDER THE BARS, AND 17 DIAMETERS FOR BARS NEAR BOTTOM OF MEMBERS. SECONDARY BARS WHEN SPLICED SHALL LAP 17 DIAMETERS OF THE BAR.
DIMENSIONS FOR REINFORCING STEEL NOT SHOWN AS CLEAR SHALL BE TO THE CENTERLINE OF THE BAR.
SOUNDINGS AND DEPTH OF FOOTINGS ARE IN ACCORDANCE WITH THE BEST AVAILABLE DATA, AND WHEN DIFFERENT CONDITIONS ARE ENCOUNTERED THE BRIDGE ENGINEER WILL INSPECT AND DETERMINE IF REVISION IS NECESSARY.
FOOTINGS IN ROCK SHALL BE POURED OUT TO ROCK AND NOT FORMED.
WHEN EXCAVATING FOR FOOTINGS THE FINAL ONE FOOT IN DEPTH SHALL BE DONE BY HAND [illegible] METHODS.
FOR DETAILS OF STRUCTURAL EXCAVATION AND STRUCTURE BACKFILL, SEE STANDARD [illegible].
WELDING SHALL CONFORM TO THE LATEST EDITION OF THE A.W.S. STANDARD SPECIFICATIONS FOR WELDING HIGHWAY BRIDGES.
ALL DIMENSIONS AND ELEVATIONS RELATIVE TO THE EXISTING STRUCTURE ARE BASED ON THE ORIGINAL CONSTRUCTION PLANS OF THE EXISTING STRUCTURE AND SHALL BE CHECKED IN THE FIELD BY THE [illegible] CONTRACTOR PRIOR TO THE START OF CONSTRUCTION.
ALL CONCRETE SURFACES MARKED WITH THE SYMBOL [illegible] AS SHOWN ON SHEET NO. [illegible] SHALL RECEIVE CLASS "1" SURFACE FINISH.

	Item	Description	Unit	So. Abut.	Frame	N. Abut.	App. Slab	Total
SUMMARY OF QUANTITIES								
Str. No. E-16-EH	11	Removal of Portions of Present Structure	Ea.					1
	14	Uncl. Str. Excav. Bridges	Cu. Yd.	20	177	20		217
	16	Str. Backfill (Cl. 1)	Cu. Yd.	15	138	15		168
	37	Conc. Pavement (10")	Sq. Yd.				69	
	46	Class "A" Concrete	Cu. Yd.	80.1	330.6	80.3		491.6
	47	Reinf. Steel	Lb.	13,210	72,550	13,210	2700	96,970
	61	St'l Piling (12 BP 53)	Lin. Ft.	140		172		# 312
	90	1½" Elec. Cond. with Jctn. Boxes	Lin. Ft.	50	110	50		210
	11	Reset St'l Railing	Lin. Ft.	90	220	90		400
	①	½" Jt. Filler (Type I)	Sq. Ft.	24	22	24		70
Str. No. E-16-ER	11	Removal of Portions of Present Structure	Ea.					1
	14	Uncl. Str. Excav. Bridges	Cu. Yd.		89			89
	16	Str. Backfill (Cl. 1)	Cu. Yd.		69			69
	37	Conc. Pavement (10")	Sq. Yd.				37	
	46	Cl. "A" Conc.	Cu. Yd.	21.0	172.5	21.0		214.5
	47	Reinf. Steel	Lb.	3,810	33,140	3,810	1600	42,760
	11	Reset St'l Railing	Lin. Ft.	45	110	45		200
	①	½" Jt. Filler (Type I)	Lin. Ft.	12	11	12		35

① ALL EXPANSION JOINT AND JOINT FILLER MATERIAL SHALL CONFORM TO AASHO SPEC. M-153-[illegible] AND SHALL BE PAID FOR IN THE BID PRICE FOR CLASS A CONCRETE.

THE APPROACH SLAB QUANTITIES ARE NOT INCLUDED IN THE BRIDGE QUANTITIES BUT ARE INCLUDED IN THE ROADWAY QUANTITIES.

DESIGNING DATA.
A.A.S.H.O. UNIT STRESSES
fc = 1,200 Lbs. per sq. in.
fs = 20,000 Lbs. per sq. in. (Reinf.)
n = 10

LOADING DATA.
LIVE LOAD = H20-S16-44 A.A.S.H.O. Interstate Alternate Loading

DEAD LOAD = Assumes 25 Lbs. per sq. ft. additional wearing surface.

BRIDGE WIDENINGS
STRUCTURE NO. E-16-EH & E-16-ER

PLANS PREPARED BY:
BURGWIN AND MARTIN
Consulting Engineers
[illegible] Denver, Colorado

COLORADO
DEPARTMENT OF HIGHWAYS
46TH AVENUE INTERCHANGE
I 25 (N.B.) & (S.B.)
GENERAL PLAN
AND ELEVATION
Across 48TH AVE. & C.B.&Q.R.R.
Sta. 25+[illegible]
Near ______ Sec. [illegible] T. 3 S. [illegible]
Designed by B.C.S. | Approved by Bridge Engineer
Made by K.L.R.
Checked by N.W.D. | Date: 19

See Standard M-100-1 for STANDARD SYMBOLS

STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS—STATE OF COLORADO

P.E., R.O.W., AND UTILITIES UNDER PROJ. IR(CX) 25-3(103)

FEDERAL ROAD REGION NO	DIVISION	PROJECT NO	SHEET NO
VIII	COLORADO	IRD(E) 25-2(242)	1

AS CONSTRUCTED					
NO REVISIONS		REVISED	[illegible]	VOID	

	REVISIONS		
R-1	DCS	1,4,5,6,7,9,37,38,42,53,62,64	7-16-91

FINAL PLAN AND PROFILE OF ~~PROPOSED~~ AS CONSTRUCTED

FEDERAL AID PROJECT NO. IRD(E) 25-2(242)

DENVER AND ADAMS COUNTIES

STATE HIGHWAY NO. 25

SCALES OF ORIGINAL DRAWINGS

ON PLAN, 1 IN. = 50 FT.

ON PROFILE { 1 IN. = 50 FT. HORIZONTAL; 1 IN. = 10 FT. VERTICAL

TABULATION OF LENGTH

ATION I 25	ROADWAY		# STR. NO. E-16-NX	
	LIN. FT.	MILES	LIN. FT.	MILES
EG. IRD(E) 25-2(242) = ROJ. I 25-3(54)215 = T 215.043				
	3535.00	0.670		
70 RAMP				
	1964.73	0.372		
3 = 8 I 70 RAMP = 9 STR. E-16-NX				
	182.50	0.034	182.50	0.034
3 = 9 STR. E-16-NX				
	1102.77	0.209		
END IRD(E) 25-2(242) = PROJ. CC01-0025-48 = T 213.758				
NET & GROSS LENGTH	6785.00	1.285	182.50	0.034

FOR INFORMATION ONLY - STR. E-16-NX ON I 70 RAMP

I 25 DESIGN DATA

DEGREE OF CURVE	1°00'
GRADE	1.735%
SSD HORIZONTAL	650'
SSD VERTICAL	790'
DESIGN SPEED	70 MPH
DT	227,000
DHV	22,700

446+65 BEGIN IRD(E) 25-2(242) =

446+65 PROJ. I 25-3(54)215 =
MILE POST 215.043

501+64.73 BEG STR. NO. E-16-NX
STR. STA. 29+15.49
503+47.23 END STR. NO. E-16-NX
STR. STA. 27+32.99

514+50 END IRD(E) 25-2(242) =

514+50 PROJ. CC01-0025-48 =
MILE POST 213.758

INDEX OF SHEETS

NEW AND REVISED STANDARDS

M-203-11	SUPERELEVATION OF CURVES - DIVIDED HIGHWAYS SHOULDER PIVOT 8-16-84
M-203-12	SUPERELEVATION OF CURVES - STREETS 8-16-84
M-606-12	GUARD RAIL TYPE 4 CONCRETE BARRIER (9 SHEETS) 2-18-83
M-620-2	FIELD LABORATORY CLASS 2 5-25-86

AS CONSTRUCTED INFORMATION

CONTRACTOR [illegible]

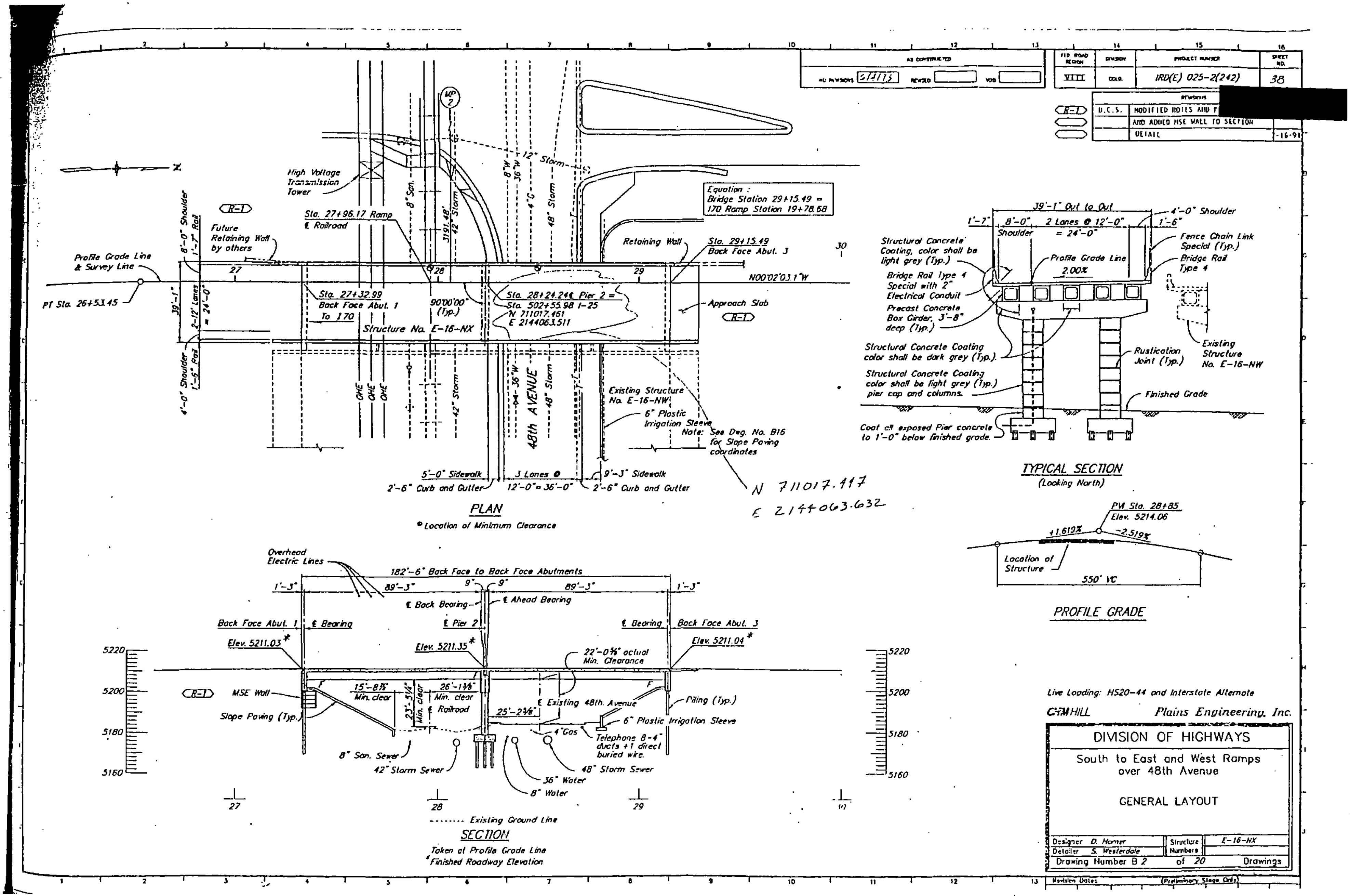
ENGINEER (Project or Resident) [illegible]

PROJECT STARTED [illegible] 1991

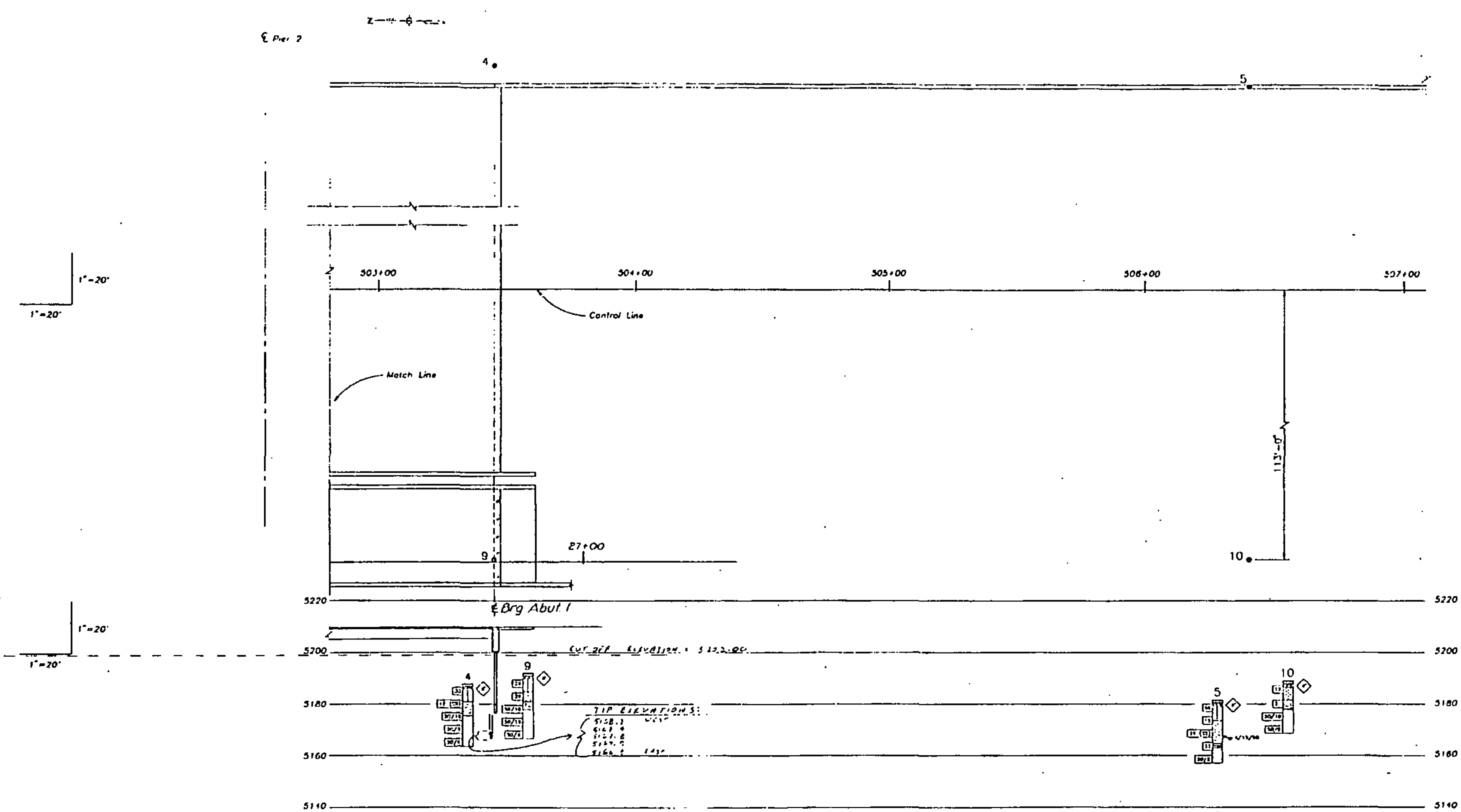
PROJECT COMPLETED [illegible] 1993

TITLE DATE

MP 213.76-215.04 DCS (DIST. 6)


AS CONSTRUCTED
NO REVISIONS 6/4/13 REVISED VOID
FED ROAD REGION VIII
DIVISION COLO.
PROJECT NUMBER IRD(E) 025-2(242)
SHEET NO. 38
REVISIONS
R-1 D.C.S. MODIFIED NOTES AND [redacted]
AND ADDED MSE WALL TO SECTION
DETAIL
-16-91
High Voltage Transmission Tower
12" Storm
8" San.
42" Storm
4" G
48" Storm
Equation : Bridge Station 29+15.49 = 170 Ramp Station 19+78.68
Sta. 27+96.17 Ramp ℄ Railroad
8'-0" Shoulder
1'-7" Rail
Future Retaining Wall by others
Profile Grade Line & Survey Line
PT Sta. 26+53.45
39'-1"
2-12' Lanes = 24'-0"
Sta. 27+32.99 Back Face Abut. 1 To 170
90°00'00" (Typ.)
Structure No. E-16-NX
Sta. 28+24.24℄ Pier 2 = Sta. 502+55.98 I-25 N 711017.461 E 2144063.511
Retaining Wall
Sta. 29+15.49 Back Face Abut. 3
N00°02'03.1"W
Approach Slab
4'-0" Shoulder
1'-6" Rail
OHE
48th AVENUE
Existing Structure No. E-16-NW
6" Plastic Irrigation Sleeve
Note: See Dwg. No. B16 for Slope Paving coordinates
5'-0" Sidewalk
2'-6" Curb and Gutter
3 Lanes @ 12'-0" = 36'-0"
9'-3" Sidewalk
2'-6" Curb and Gutter
N 711017.417
E 2144063.632
PLAN
* Location of Minimum Clearance
39'-1" Out to Out
8'-0" Shoulder
2 Lanes @ 12'-0" = 24'-0"
4'-0" Shoulder
Structural Concrete Coating, color shall be light grey (Typ.)
Bridge Rail Type 4 Special with 2" Electrical Conduit
Precast Concrete Box Girder, 3'-8" deep (Typ.)
Profile Grade Line 2.00%
Fence Chain Link Special (Typ.)
Bridge Rail Type 4
Structural Concrete Coating color shall be dark grey (Typ.)
Structural Concrete Coating color shall be light grey (Typ.) pier cap and columns.
Rustication Joint (Typ.)
Existing Structure No. E-16-NW
Finished Grade
Coat all exposed Pier concrete to 1'-0" below finished grade.
TYPICAL SECTION
(Looking North)
PVI Sta. 28+85 Elev. 5214.06
+1.619%
-2.519%
Location of Structure
550' VC
PROFILE GRADE
Overhead Electric Lines
182'-6" Back Face to Back Face Abutments
1'-3" 89'-3" 9" 9" 89'-3" 1'-3"
℄ Back Bearing
℄ Ahead Bearing
Back Face Abut. 1
℄ Bearing
℄ Pier 2
Back Face Abut. 3
Elev. 5211.03*
Elev. 5211.35*
Elev. 5211.04*
22'-0 3/8" actual Min. Clearance
MSE Wall
Slope Paving (Typ.)
15'-8 7/8" Min. clear
23'-5 1/4" Min. clear
26'-1 3/8" Min. clear ℄ Railroad
25'-2 3/8"
℄ Existing 48th. Avenue
Piling (Typ.)
6" Plastic Irrigation Sleeve
4" Gas
Telephone 8-4" ducts +1 direct buried wire.
8" San. Sewer
42" Storm Sewer
36" Water
8" Water
48" Storm Sewer
5220 5200 5180 5160
27 28 29
Existing Ground Line
SECTION
Taken at Profile Grade Line
*Finished Roadway Elevation
Live Loading: HS20-44 and Interstate Alternate
CH2M HILL
Plains Engineering, Inc.
DIVISION OF HIGHWAYS
South to East and West Ramps over 48th Avenue
GENERAL LAYOUT
Designer D. Homer
Detailer S. Westerdale
Structure Numbers E-16-NX
Drawing Number B 2 of 20 Drawings
Revision Dates
(Preliminary Stage Only)

AS CONSTRUCTED						
NO REVISIONS	REVISED 6/7/93	VOID				
				IR(OE) 25-2(242)	39	224



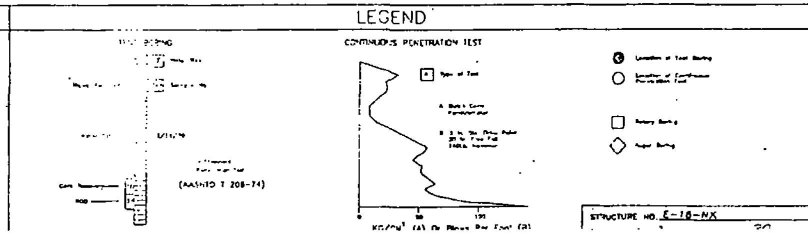
SUMMARY OF TEST RESULTS

[illegible]	.				18				3.3	118.1				2.0
[illegible]	A-1-b(0)	45	37	19	3 6									2.0
[illegible]					41				11.4	120.4				2.0
[illegible]														2.0
[illegible]	A-1-b(0)	49	38	12	3 1									2.0
[illegible]	A-4(0)				35	23	17	6	8.2	118.1				2.0
[illegible]									19.6	130.5	4.59			2.0
[illegible]	A-6(13)				76	39	21	18	17.0	131.9				2.0
[illegible]	A-3(0)				18				3.8	106.7				2.0
[illegible]	A-7-6(14)					42	26	16	18.1	128.7				2.0

TYPE OF MATERIAL

- TOPSOIL
- ASPHALTIC CONCRETE PAVEMENT
- AGGREGATE BASE COURSE
- FILL MATERIAL
- SAND: silty
- SAND: trace to some
- SAND and GRAVEL
- CLAY (severely weathered claystone bedrock)
- CLAYSTONE BEDROCK, weathered
- SANDSTONE BEDROCK, weathered

LEGEND

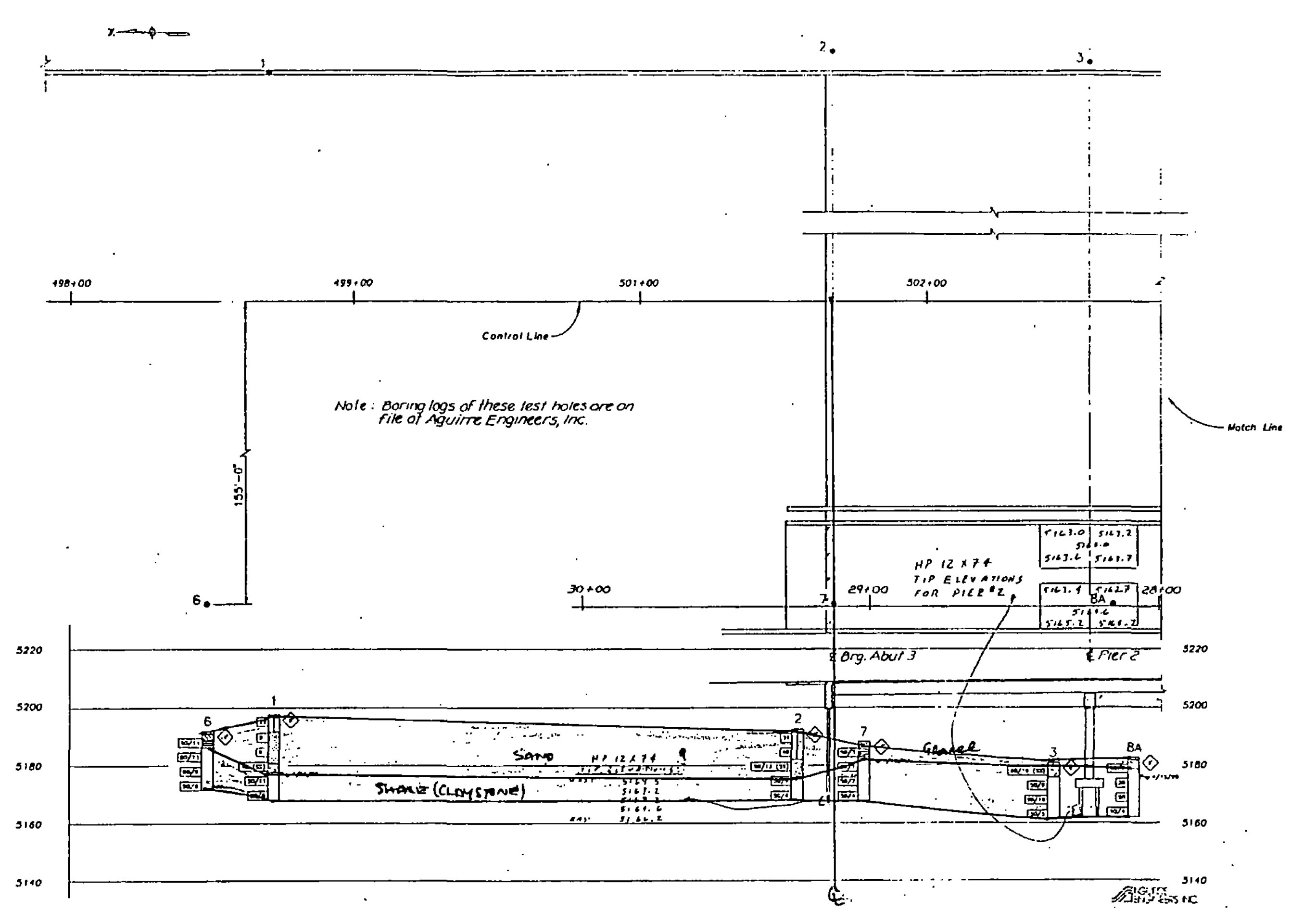


STRUCTURE NO. E-16-HX

DIVISION OF HIGHWAYS

ENGINEERING GEOLOGY

AS CONSTRUCTED							
NO REVISIONS	REVISED 6/4/73	VOID		COLORADO	IR 0(E) 25-2(242)	40	224



SUMMARY OF TEST RESULTS

	AASHTO														
	A-4(0)				38	25	[illegible]	[illegible]	5.9	118.9				2.0
	A-3(0)	0	5	85	10				3.7	103.3				2.0
	A-4(0)				37	22	21	1						2.0
	A-2-4(0)	1	3	62	34				11.9	114.6				2.0
	A-1-b(0)	48	30	18	3.6									1.4
									18.7	130.3				2.0
	A-1-a(0)	54	34	10	2.1									1.4
	A-6(10)				64	34			5.8	120.2				2.0
	A-6(15)				70	34			[illegible]	120.1				2.0
									5.1	127.8				2.0
									5.7	118.7				2.0
									25.5	125.5				2.0
									21.2	119.5				2.0
									21.2	125.5	4.96			2.0
									20.2	127.1	4.99			2.0
	A-7-6(17)				69	43	26	17	17.4	133.8				2.0
									22.6	130.3				2.0

TYPE OF MATERIAL

- TOPSOIL
- ASPHALTIC CONCRETE PAVEMENT
- AGGREGATE BASE COURSE
- FILL MATERIAL
- SAND: silty
- SAND: trace to some
- SAND and GRAVEL
- CLAY (severely weathered claystone bedrock)
- CLAYSTONE BEDROCK; weathered
- SANDSTONE BEDROCK; weathered

LEGEND

TEST BORING

CONTINUOUS PENETRATION TEST

(AASHTO T 206-74)

KG/CM² (A) Or Blows Per Foot (B)

AGUIRRE ENGINEERS INC

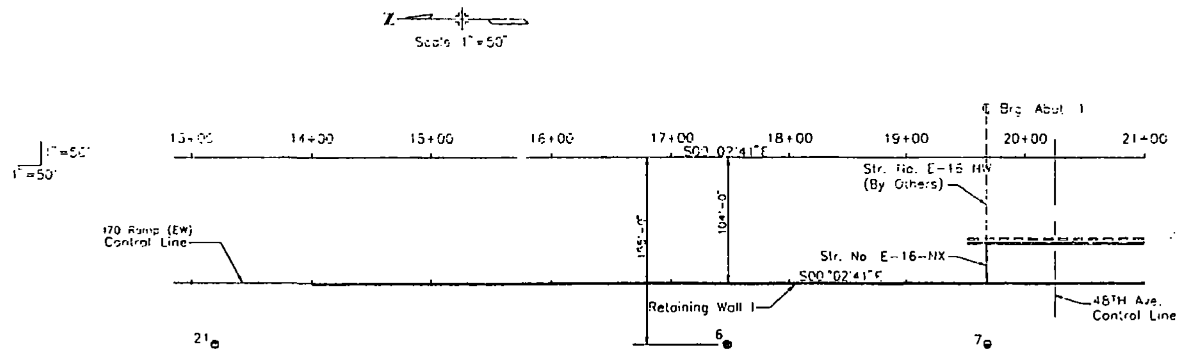
DIVISION OF HIGHWAYS

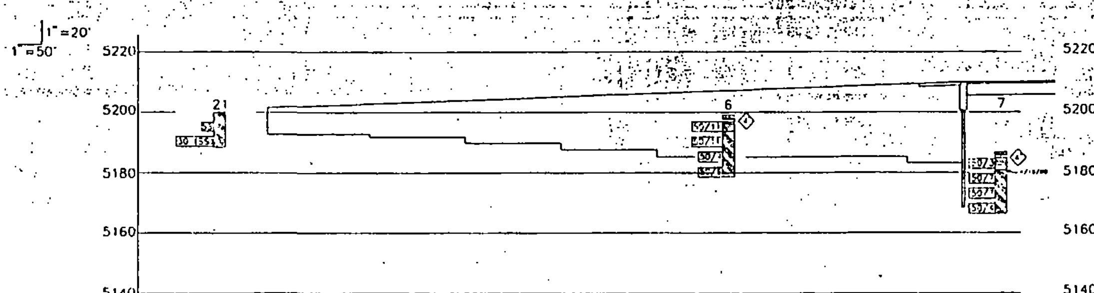
ENGINEERING GEOLOGY

STRUCTURE NO. E-16-NX

20

AS CONSTRUCTED							
NO REVISIONS	REVISED 6/4/73	VOID			IRD(E)25-2(242)	71	221

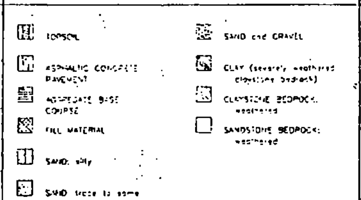




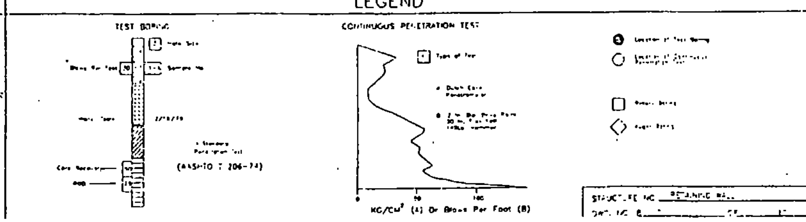
AGUIRRE ENGINEERS, INC.
Geotechnical and Material Consultants

SUMMARY OF TEST RESULTS

TYPE OF MATERIAL



LEGEND

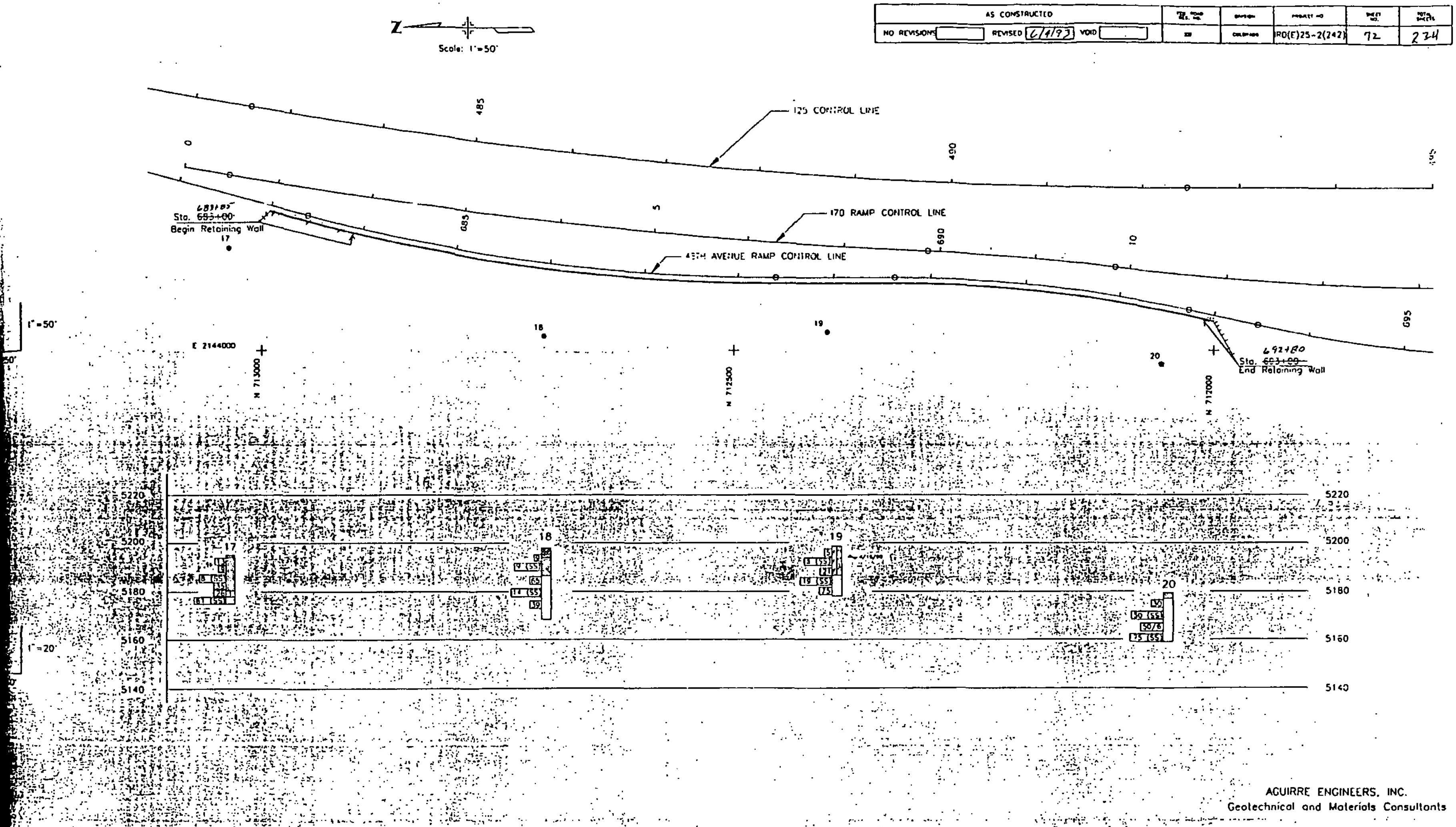


DIVISION OF HIGHWAYS

ENGINEERING GEOLOGY
RETAINING WALL 1

STRUCTURE NO. RETAINING WALL

AS CONSTRUCTED			[illegible]	[illegible]	PROJECT NO	SHEET NO.	TOTAL SHEETS
NO REVISIONS	REVISED 6/4/93	VOID	[illegible]	[illegible]	IRD(E)25-2(242)	72	224



AGUIRRE ENGINEERS, INC.
Geotechnical and Materials Consultants

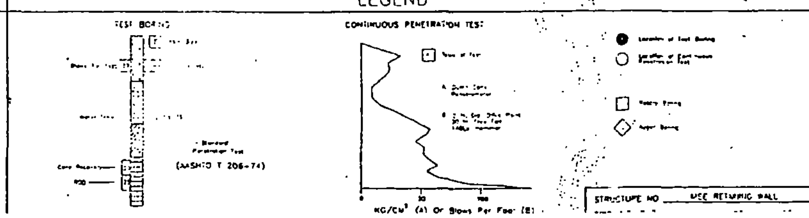
SUMMARY OF TEST RESULTS

A-7-5	1	6	21	72	46	18	28	22.5					2.0
-4					25	22	3	25.1					1.5
-2-6				32	25	13	12	9.8					—
								27.5	117.7				2.0
A-7-6	0	2	7	91	50	22	34	34.8		1.2+			1.5
-4	0	7	52	41	26	19	7	19.9					—

TYPE OF MATERIAL

- TOPSOIL
- ASPHALTIC CONCRETE PAVEMENT
- AGGREGATE BASE COURSE
- FILL MATERIAL
- SAND silty
- SAND trace to some
- SAND and GRAVEL
- CLAY (severely weathered claystone bedrock)
- CLAYSTONE BEDROCK, weathered
- SANDSTONE BEDROCK, weathered

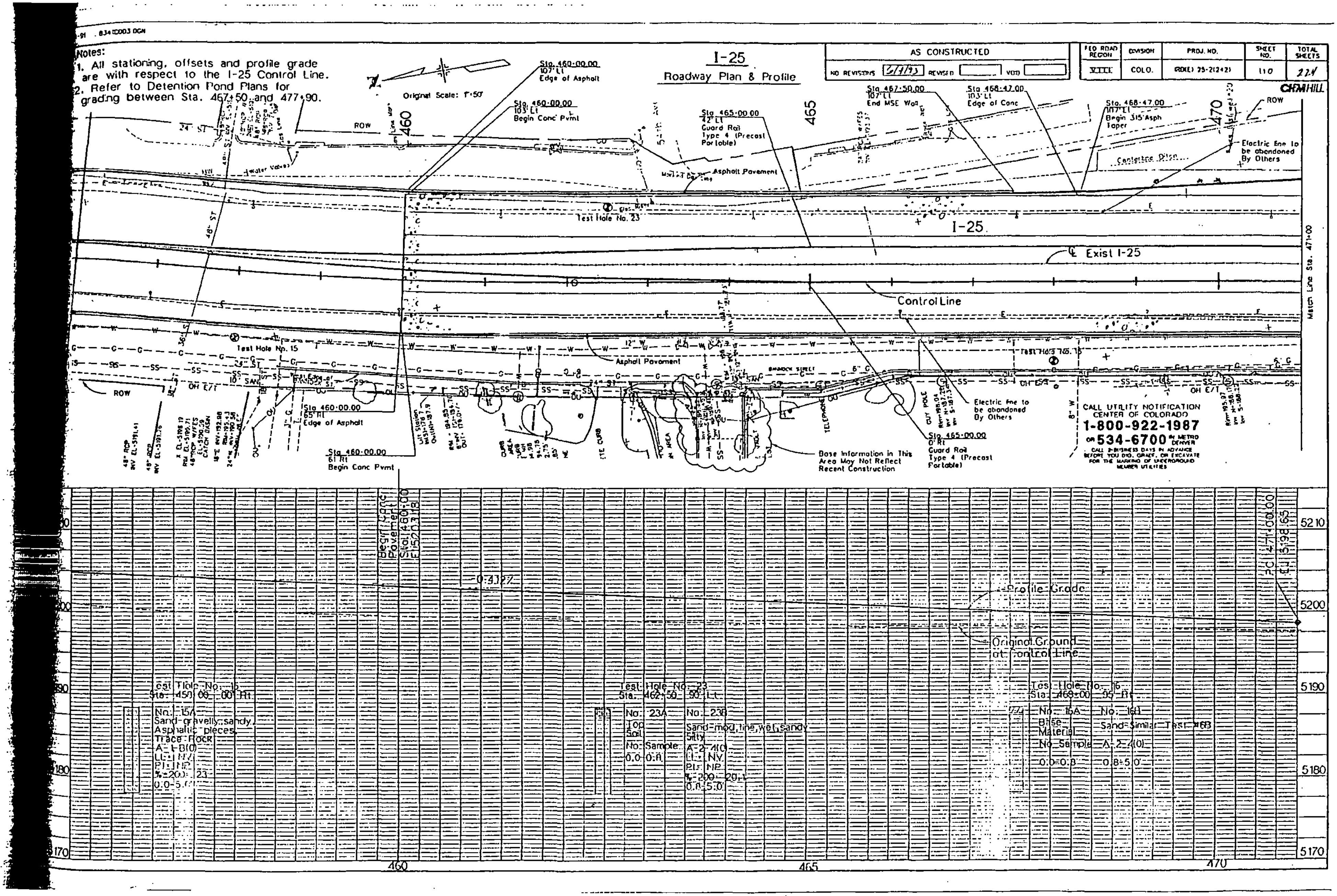
LEGEND



DIVISION OF HIGHWAYS

ENGINEERING GEOLOGY
MSE TEMPORARY WALL

STRUCTURE NO MSE RETAINING WALL



Notes:
1. All stationing, offsets and profile grade are with respect to the I-25 Control Line.
2. Refer to Detention Pond Plans for grading between Sta. 467+50 and 477+90.
Original Scale: 1"=50'
I-25
Roadway Plan & Profile
AS CONSTRUCTED
NO REVISIONS
REVISED
VOID
FED ROAD REGION
DIVISION
PROJ. NO.
SHEET NO.
TOTAL SHEETS
VIII
COLO.
IR(X) 25-2(242)
110
224
CH2M HILL
Sta. 460+00.00 107' Lt Edge of Asphalt
Sta. 460+00.00 103' Lt Begin Conc Pvmt
Sta. 465+00.00 42' Lt Guard Rail Type 4 (Precast Portable)
Sta. 467+50.00 107' Lt End MSE Wall
Sta. 468+47.00 103' Lt Edge of Conc
Sta. 468+47.00 107' Lt Begin 315' Asph Taper
Electric line to be abandoned By Others
Test Hole No. 23
Test Hole No. 15
Test Hole No. 16
I-25
Exist I-25
Control Line
Asphalt Pavement
Sta. 460+00.00 65' Rt Edge of Asphalt
Sta. 460+00.00 61' Rt Begin Conc Pvmt
Base Information in This Area May Not Reflect Recent Construction
Sta. 465+00.00 0' Rt Guard Rail Type 4 (Precast Portable)
CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
OR 534-6700 IN METRO DENVER
Match Line Sta. 471+00
ROW
Begin Conc Pavement Sta. 460+00 El 5203.18
-0.412%
Profile Grade
Original Ground at Control Line
PC 471+00.00 El 5198.65
Test Hole No. 15 Sta. 459+00 00' Rt
No. 15A Sand-gravelly, sandy, Asphaltic pieces, Trace Rock A-1-b(0) LL: NV PI: NP %-200: 23 0.0-5.0
Test Hole No. 23 Sta. 462+50 90' Lt
No. 23A Top Soil No Sample 0.0-0.8
No. 23B Sand-mod. fine, wet, sandy, silty A-2-4(0) LL: NV PI: NP %-200: 20.1 0.8-5.0
Test Hole No. 16 Sta. 469+00 95' Rt
No. 16A Base Material No Sample 0.0-0.8
No. 16B Sand-Similar Test #6B A-2-4(0) 0.8-5.0
5210
5200
5190
5180
5170
460
465
470

8341C004.DCN

Notes:

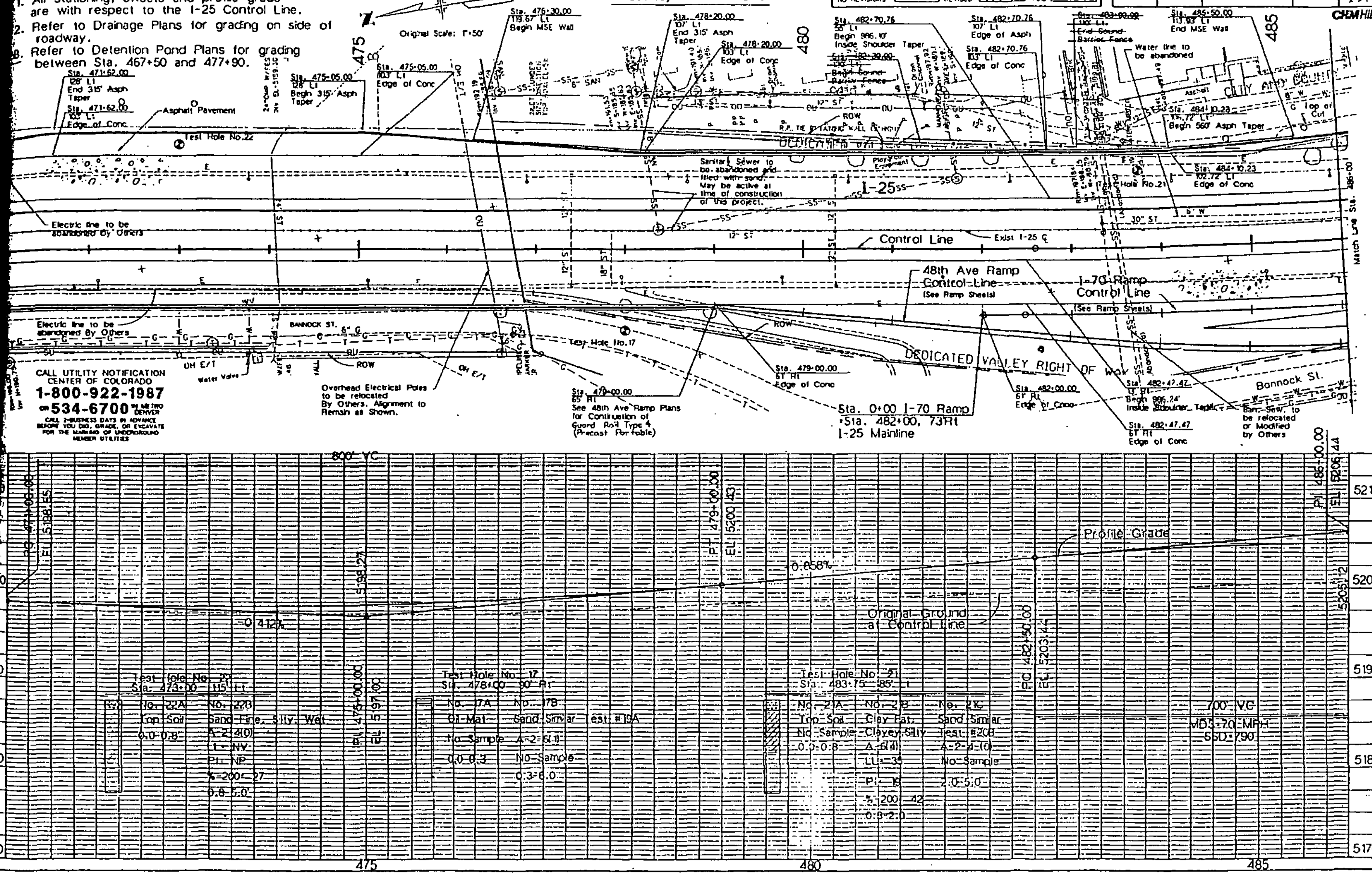
1. All stationing, offsets and profile grade are with respect to the I-25 Control Line.
2. Refer to Drainage Plans for grading on side of roadway.
3. Refer to Detention Pond Plans for grading between Sta. 467+50 and 477+90.

I-25
Roadway Plan & Profile

AS CONSTRUCTED		
NO REVISIONS	REVISED 6/9/93	VOID

FED ROAD REGION	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
VIII	COLO.	IR(IX) 25-2(242)	111	224

CH2M HILL



8341C05.DGN

Notes:

1. All stationing, offsets and profile grade are with respect to the I-25 Control Line.

I-25

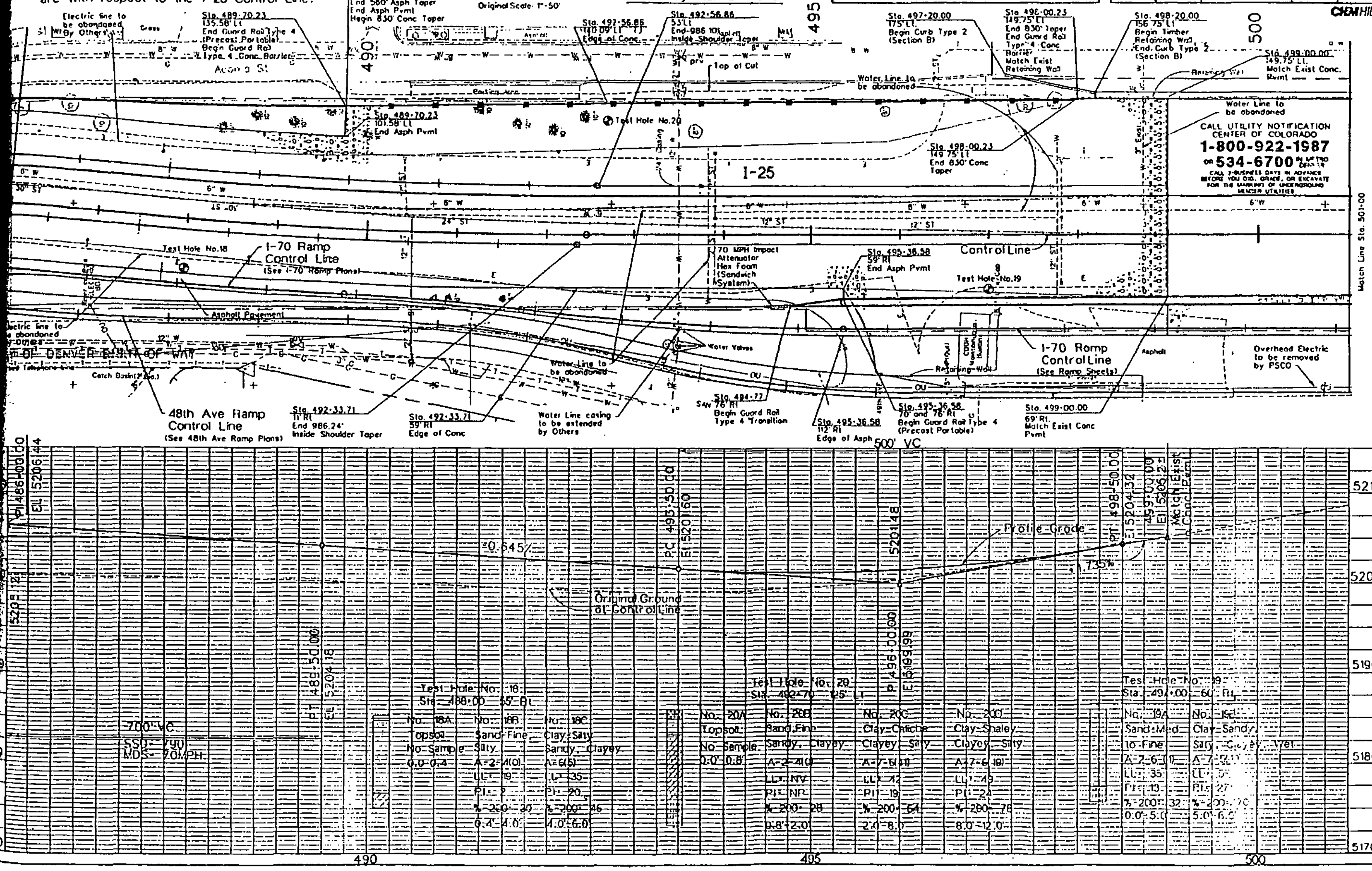
Roadway Plan & Profile

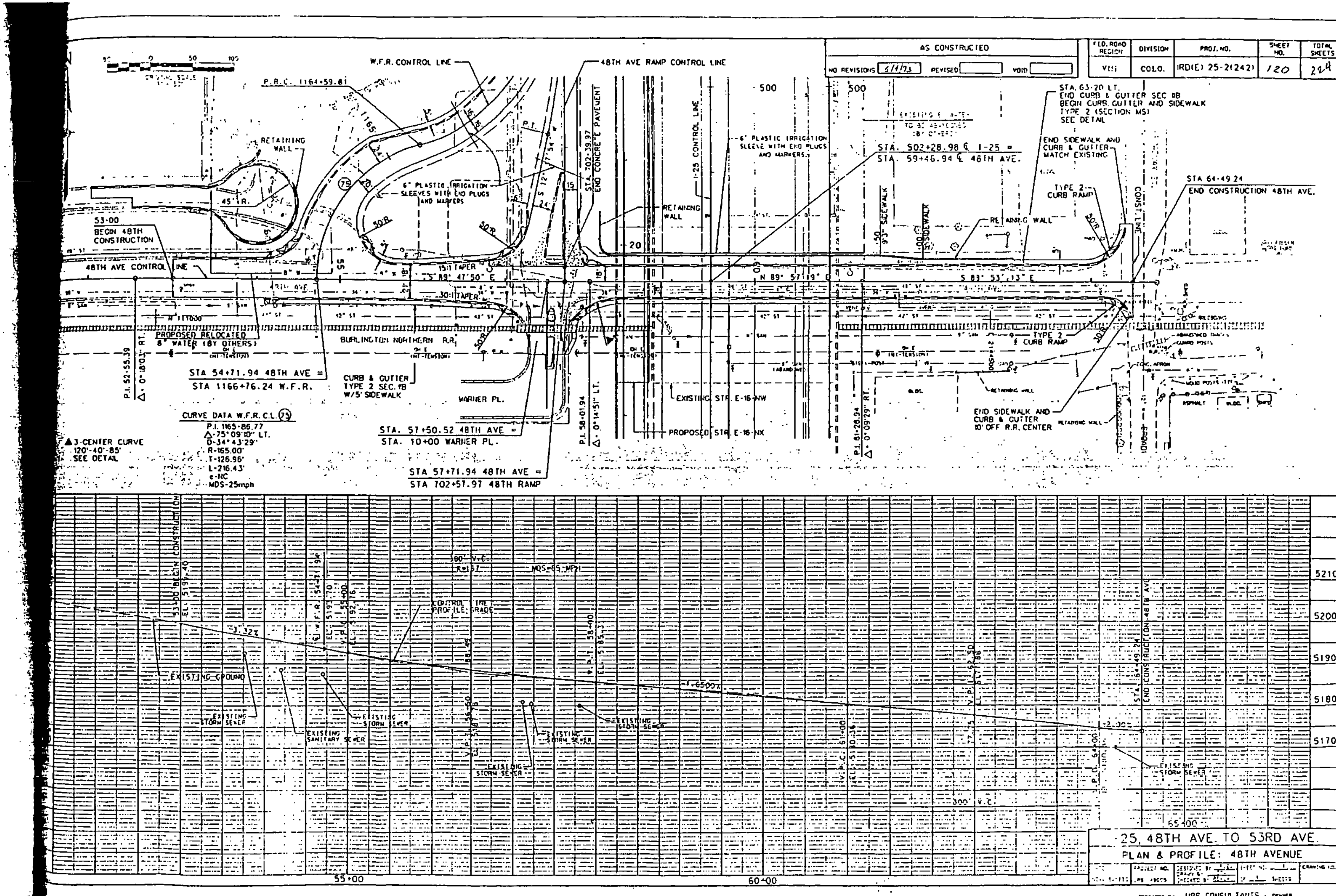
Original Scale: 1"=50'

AS CONSTRUCTED		
NO REVISIONS 6/1/93	REVISED	VOID

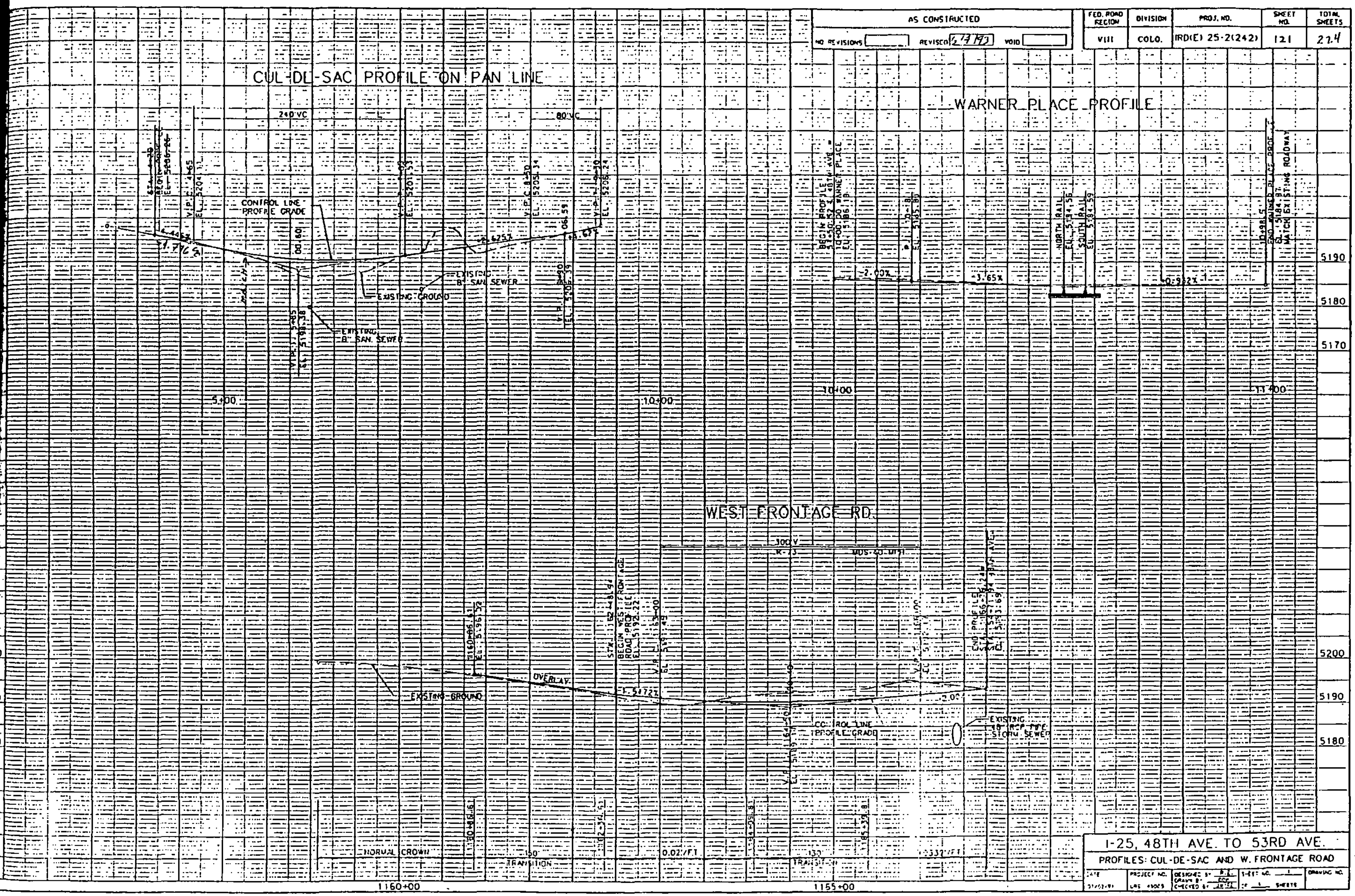
FED. ROAD REGION	DIVISION	PROJ NO.	SHEET NO.	TOTAL SHEETS
VIII	COLO.	IR(IF) 25-2(242)	112	224

CH2M HILL

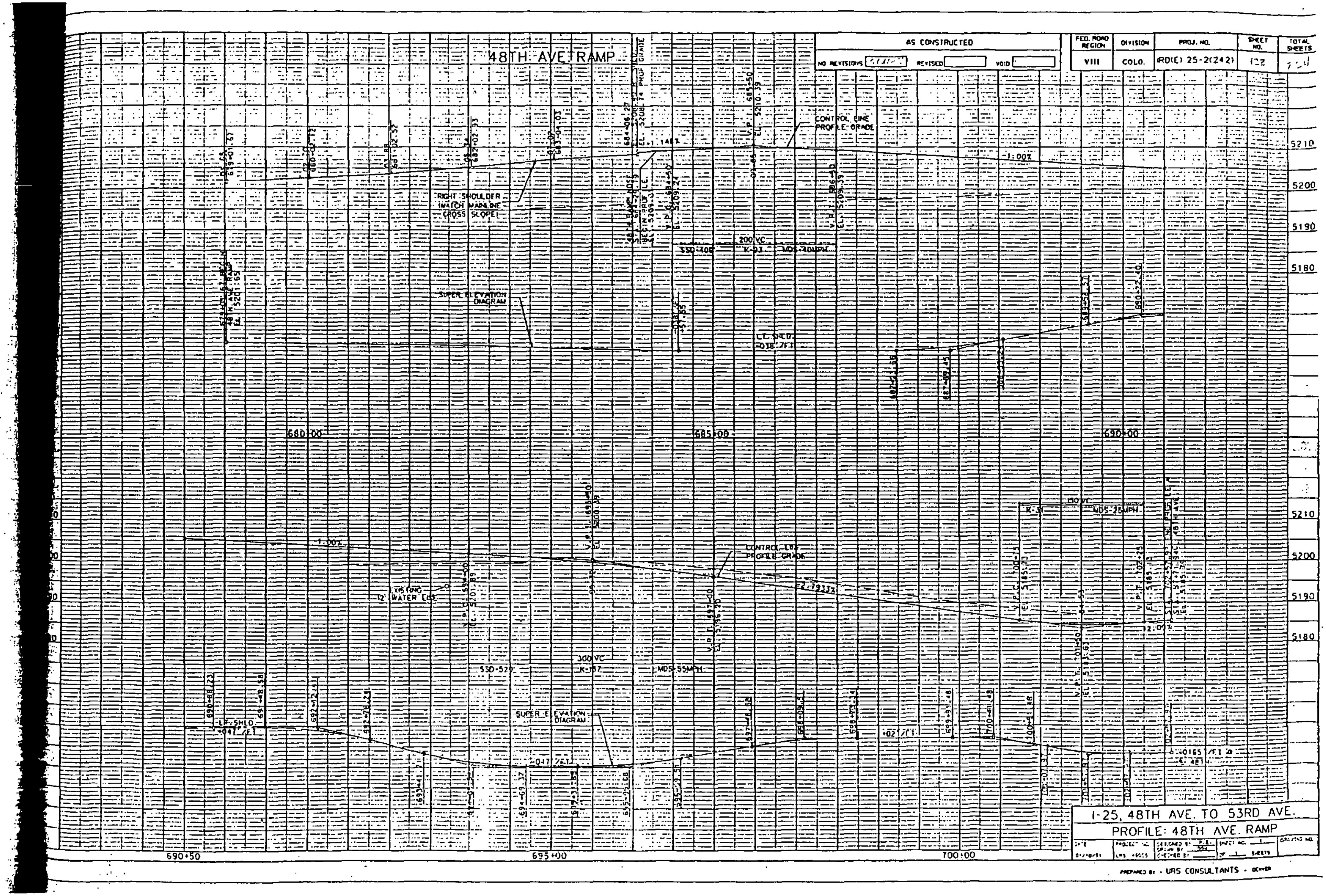




AS CONSTRUCTED
NO REVISIONS 5/1/73 REVISED VOID
FED. ROAD REGION VIII
DIVISION COLO.
PROJ. NO. IRD(E) 25-2(242)
SHEET NO. 120
TOTAL SHEETS 224
W.F.R. CONTROL LINE
48TH AVE RAMP CONTROL LINE
P.R.C. 1164+59.81
RETAINING WALL
45' R.
53+00 BEGIN 48TH CONSTRUCTION
48TH AVE CONTROL LINE
6" PLASTIC IRRIGATION SLEEVES WITH END PLUGS AND MARKERS
15:1 TAPER
S 89° 47' 50" E
30:1 TAPER
PROPOSED RELOCATED 8" WATER (BY OTHERS)
BURLINGTON NORTHERN R.R.
STA 54+71.94 48TH AVE =
STA 1166+76.24 W.F.R.
CURB & GUTTER TYPE 2 SEC. 1B W/5' SIDEWALK
WARNER PL.
CURVE DATA W.F.R. C.L. 75
P.I. 1165+86.77
Δ-75° 09' 10" LT.
D-34° 43' 29"
R-165.00'
T-126.96'
L-216.43'
e-NC
MDS-25mph
3-CENTER CURVE 120'-40'-85' SEE DETAIL
STA. 57+50.52 48TH AVE =
STA. 10+00 WARNER PL.
STA 57+71.94 48TH AVE =
STA 702+51.97 48TH RAMP
STA. 702+39.37 END CONCRETE PAVEMENT
P.I. 52+55.39 Δ-0° 18' 03" RT.
P.I. 58+01.94 Δ-0° 14' 51" LT.
I-25 CONTROL LINE
6" PLASTIC IRRIGATION SLEEVE WITH END PLUGS AND MARKERS
RETAINING WALL
EXISTING STR. E-16-NW
PROPOSED STR. E-16-NX
STA. 502+28.98 ℄ I-25 =
STA. 59+46.94 ℄ 48TH AVE.
N 89° 57' 19" E
S 89° 53' 13" E
STA. 63+20 LT.
END CURB & GUTTER SEC 8B
BEGIN CURB, GUTTER AND SIDEWALK TYPE 2 (SECTION MS)
SEE DETAIL
END SIDEWALK AND CURB & GUTTER MATCH EXISTING
TYPE 2 CURB RAMP
RETAINING WALL
STA 64+49.24 END CONSTRUCTION 48TH AVE.
CONST. LINE
TYPE 2 CURB RAMP
END SIDEWALK AND CURB & GUTTER 10' OFF R.R. CENTER
P.I. 61+28.94 Δ-0° 09' 29" RT.
300' V.C.
MDS=65 MPH
CONTROL LINE PROFILE GRADE
EXISTING GROUND
-1.32%
-1.6500%
-2.00%
EXISTING STORM SEWER
EXISTING SANITARY SEWER
53+00 BEGIN CONSTRUCTION
EL. 5199.40
END CONSTRUCTION 48TH AVE
STA. 64+49.24
300' V.C.
5210
5200
5190
5180
5170
55+00
60+00
65+00
I-25, 48TH AVE. TO 53RD AVE.
PLAN & PROFILE: 48TH AVENUE
PREPARED BY - URS CONSULTANTS - DENVER



PREPARED BY - URS CONSULTANTS - DENVER

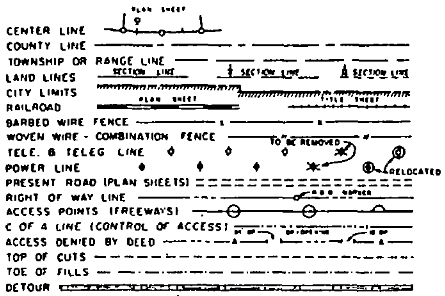

48TH AVE. RAMP
AS CONSTRUCTED
NO REVISIONS
REVISED
VOID
FED. ROAD REGION
VIII
DIVISION
COLO.
PROJ. NO.
IR(E) 25-2(242)
SHEET NO.
TOTAL SHEETS
CONTROL LINE PROFILE GRADE
RIGHT SHOULDER (MATCH MAINLINE CROSS SLOPE)
SUPER ELEVATION DIAGRAM
200 VC
MDS-40MPH
LT. SHLD.
680+00
685+00
690+00
5210
5200
5190
5180
150 VC
MDS-25MPH
1.00%
EXISTING 12" WATER LINE
300 VC
K-157
MDS-55MPH
LT. SHLD.
690+50
695+00
700+00
I-25, 48TH AVE. TO 53RD AVE.
PROFILE: 48TH AVE. RAMP
PREPARED BY - URS CONSULTANTS - DENVER

Federal Road Region No.	Division	Project No.	Sheet No.
9	Colorado	C 01-0025-09	1

AS C...
REVISED DATE Oct. 13,1971

STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS—STATE OF COLORADO

CONVENTIONAL SIGNS



PLAN OF AS CONSTRUCTED
COLORADO PROJECT NO. C 01-0025-09
STATE HIGHWAY NO. 25
DENVER COUNTY

SCALES OF ORIGINAL DRAWINGS
ON PLAN 1 IN = 100 FEET
ON PROFILE 1 IN = 50 FEET
GRADE LINE ON PROFILE IS SHOWN AS GRADE OF FINISHED ROAD

Contractor - Kenney Construction Co.
Resident Engineer - F. P. McNamara
Project Completed - Oct. 13, 1971
Construction Engineer - Approved 4-14-72

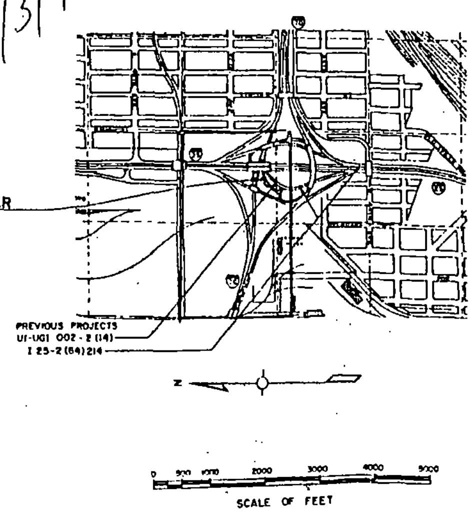
SHEET NO. — INDEX OF SHEETS

SHEET NO.	INDEX OF SHEETS
1	Sketch Map and Title Sheet.
2	Typical Sections, Summary of Earthwork Quantities, Tabulation of Surfacing Quantities and General Notes.
~~3~~	~~Summary of Approximate Quantities.~~
4	Plan Sheet.
~~5~~	~~Profile Sheet.~~
6	Details of Water and Sewer Lines.
7	Details of Sprinker System.
8 – 19	Details of Observation Tower and Buildings.
~~20 – 22~~	~~Cross Sections.~~
~~23 – 30~~	~~Final Cross Sections~~
~~31 & 32~~	~~Str. Exc. & Str. Backfill (Bldg.)~~
~~33~~	~~Sanitary Sewer Line~~
~~M-203-B~~	~~Approach Roads, Flaring, Cut Slope Treatment, Bridge & Crest Widening. — Apr. 27, 1970~~
~~M-206-AA~~	~~Excavation and Backfill for Structures. (2 Sheets) — March 1, 1971~~
~~M-614-TB~~	~~Traffic Signing for Highway Construction (3 Sheets) — Dec. 24, 1968~~

"As Constructed NO Revisions"
Sheets 8 and 12 Thru 14

As Const. File
Police Tower - I-25
WB
6/3/72

OBSERVATION TOWER

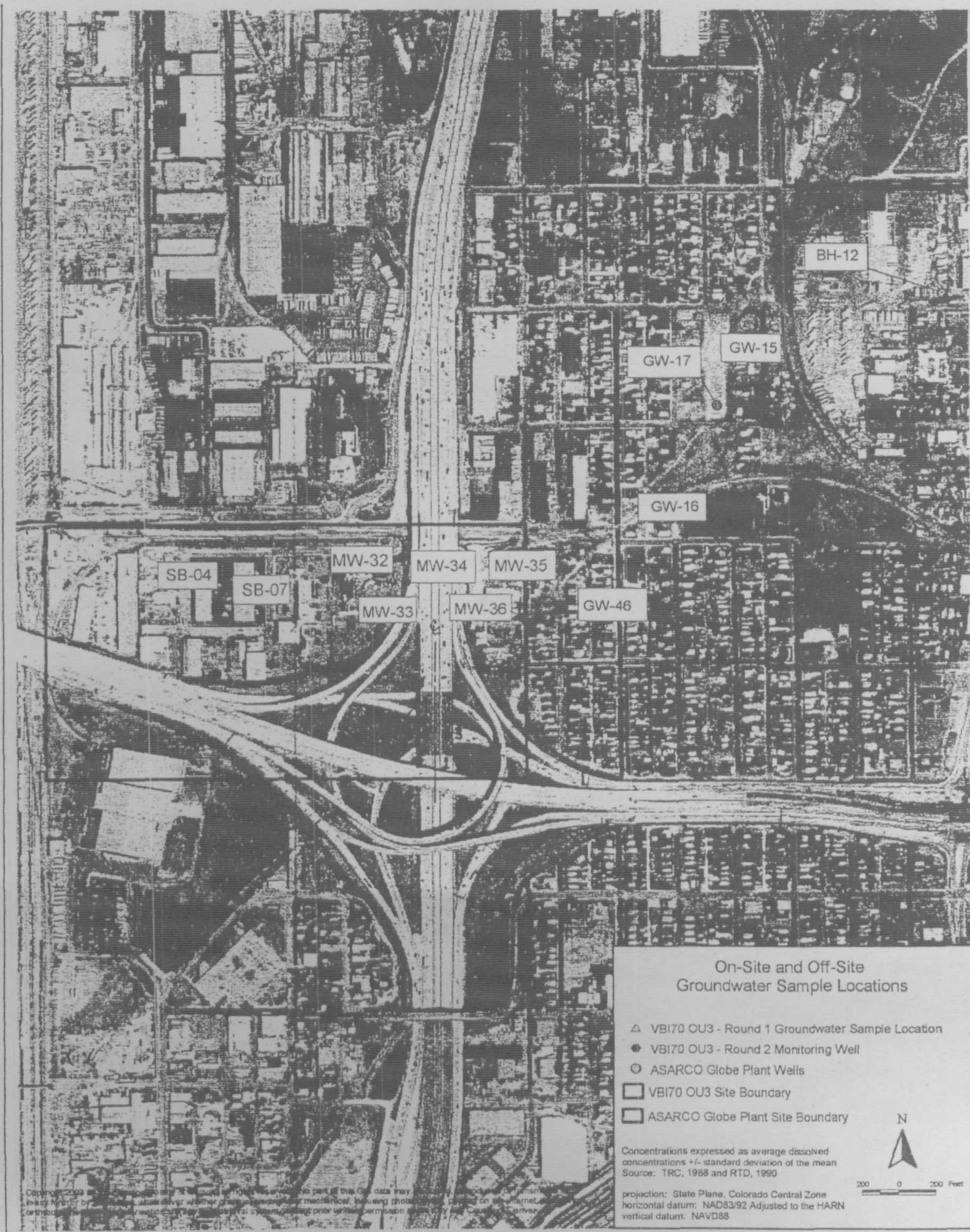


SEE SPECIAL PROVISIONS FOR NOTICE TO BIDDERS

DIVISION OF HIGHWAYS
APPROVED [signature] 3-8-71
CHIEF ENGINEER — DATE

MAY 1972
C. D. H.
MTCE. SEC. 8

RVL

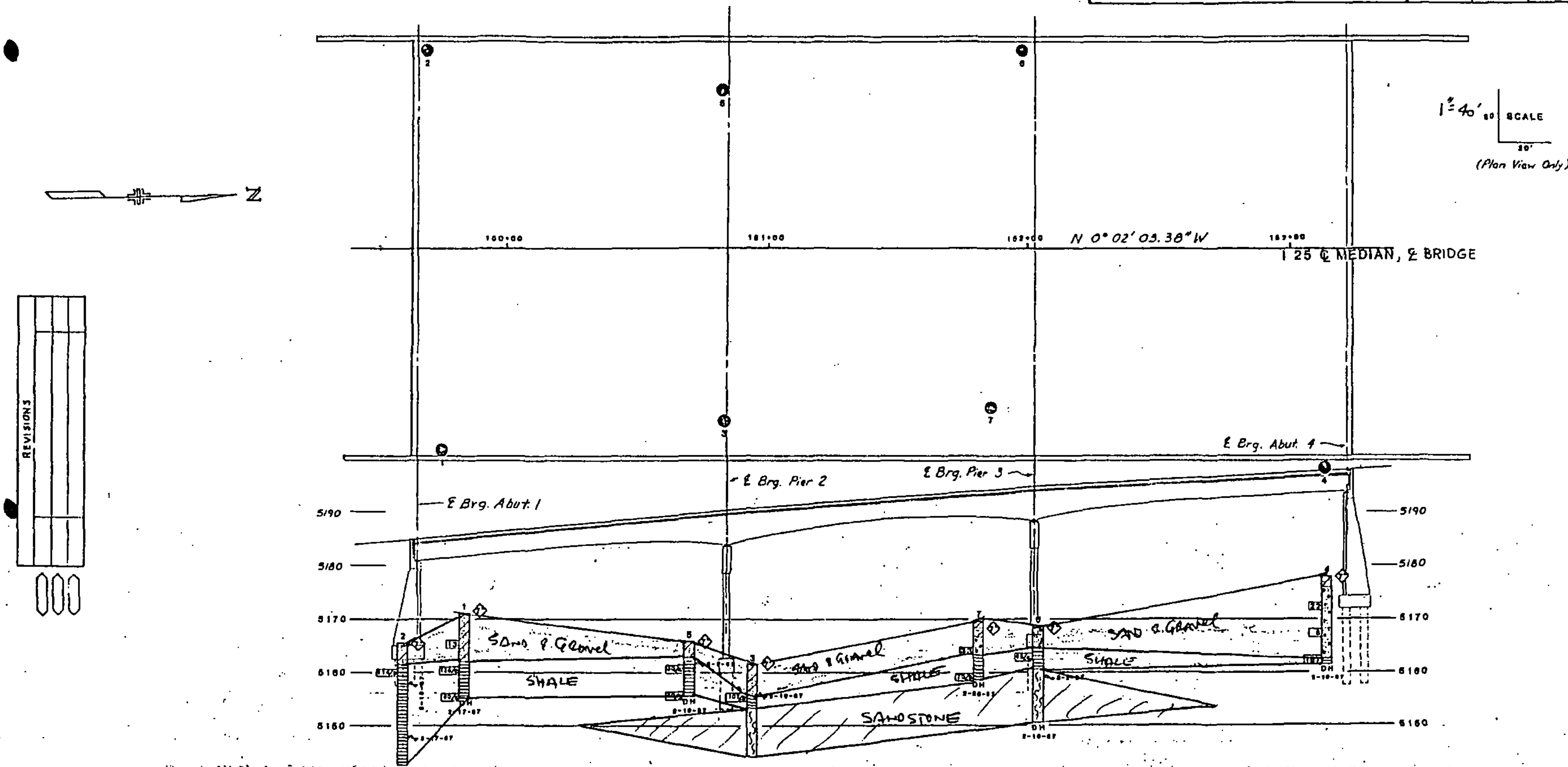


MP 213.75

1" = 500' ±

Figure 1

AS CONSTRUCTED	FED ROAD REG NO	DIVISION	PROJECT NO.	SHEET NO	TOTAL SHEETS
NO REVISIONS ☐ REVISED 10-12-91 VOID ☐	XIII	COLORADO	IR 25-2(215)	19	97

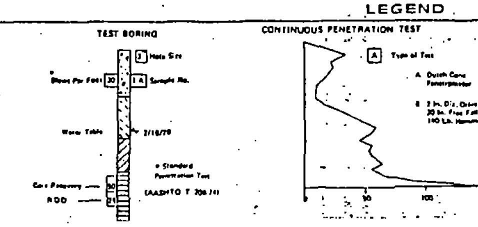


SUMMARY OF TEST RESULTS															
Depth	Classification		Grading Analysis (Percent)				Atterberg Limits			Water Cont. %	Wet Unit Weight	Unconfined Strength	Triaxial Shear Strength		Dia. of Sample
	Group of Engr. or Visual	AASHTO	Gravel	Coarse Sand	Fine Sand	Silt and Clay	Liquid Limit	Plastic Limit	Plastic Index				φ	C	

TYPE OF MATERIAL

- SANDY CLAY
- GRAVELLY SAND, SANDY GRAVEL
- SHALE BEDROCK
- SANDSTONE BEDROCK

LEGEND



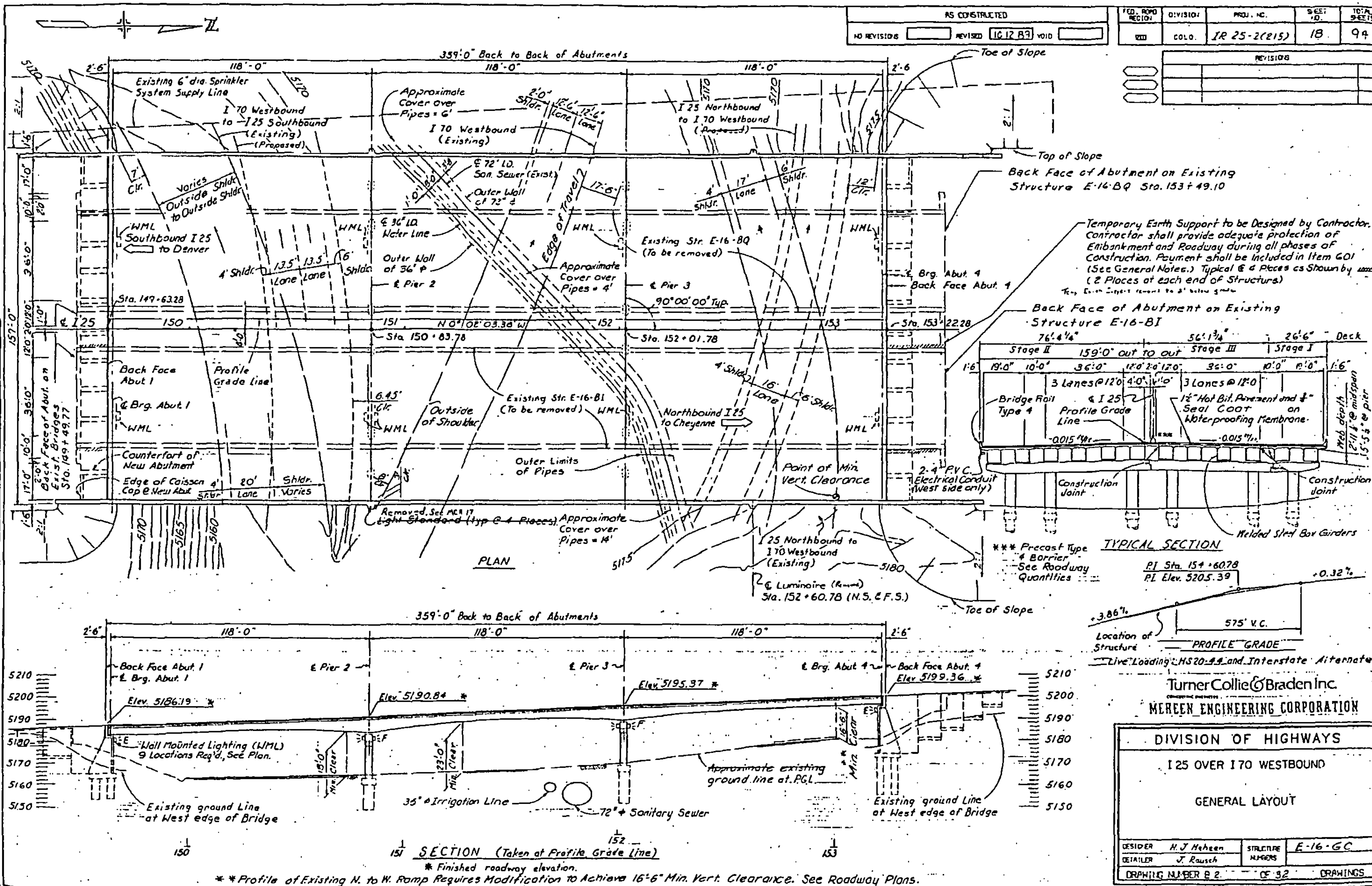
- Location of Test Boring
- Location of Continuous Penetration Test
- Rotary Boring
- Auger Boring
- DH DRY HOLE

STRUCTURE NO. E-16-GC

DIVISION OF HIGHWAYS

ENGINEERING GEOLOGY AT I 70 INTERCHANGE (PHASE 1)

Geologist LB
Drawn by TM
Checked by ES
Date 3-24-87



AS CONSTRUCTED
NO REVISIONS
REVISED 10 12 83
VOID
FED. ROAD REGION VIII
DIVISION COLO.
PROJ. NO. IR 25-2(215)
SHEET NO. 18
TOTAL SHEETS 94
REVISIONS
359'-0" Back to Back of Abutments
118'-0"
118'-0"
118'-0"
2'-6
Toe of Slope
Top of Slope
Existing 6" dia. Sprinkler System Supply Line
I 70 Westbound to I 25 Southbound (Existing) (Proposed)
Approximate Cover over Pipes = 6'
I 70 Westbound (Existing)
I 25 Northbound to I 70 Westbound (Proposed)
Back Face of Abutment on Existing Structure E-16-BQ Sta. 153+49.10
Temporary Earth Support to be Designed by Contractor. Contractor shall provide adequate protection of Embankment and Roadway during all phases of Construction. Payment shall be included in Item 601 (See General Notes.) Typical of 4 Places as Shown by (2 Places at each end of Structure)
Southbound I 25 to Denver
Existing Str. E-16-BQ (To be removed)
Approximate Cover over Pipes = 4'
℄ Pier 2
℄ Pier 3
℄ Brg. Abut. 4
Back Face Abut. 4
Sta. 149+63.28
℄ I 25
N 0°0'03.38" W
Sta. 150+83.78
Sta. 152+01.78
Sta. 153+22.28
90°00'00" Typ.
Back Face of Abutment on Existing Structure E-16-BI
Back Face Abut 1
Profile Grade Line
℄ Brg. Abut 1
Existing Str. E-16-BI (To be removed)
Northbound I 25 to Cheyenne
Outside of Shoulder
Counterfort of New Abutment
Edge of Caisson Cap @ New Abut.
Outer Limits of Pipes
Point of Min. Vert. Clearance
2-4" P.V.C. Electrical Conduit (West side only)
Back Face of Abut. on Exist. Bridges Sta. 149+49.77
Removed, See MCR 17 Light Standard (Typ @ 4 Places)
Approximate Cover over Pipes = 14'
I 25 Northbound to I 70 Westbound (Existing)
℄ Luminaire (Removed) Sta. 152+60.78 (N.S. & F.S.)
PLAN
TYPICAL SECTION
159'-0" out to out
Stage II
Stage III
Stage I
3 Lanes @ 12'0
Bridge Rail Type 4
Profile Grade Line
1½" Hot Bit. Pavement and ⅛" Seal Coat on Waterproofing Membrane
Construction Joint
Welded Steel Box Girders
*** Precast Type 4 Barrier - See Roadway Quantities
PI Sta. 154+60.78
PI Elev. 5205.39
+3.86%
+0.32%
575' V.C.
Location of Structure
PROFILE GRADE
Live Loading: HS20-44 and Interstate Alternate.
Turner Collie & Braden Inc.
MEHEEN ENGINEERING CORPORATION
Elev. 5186.19 *
Elev. 5190.84 *
Elev. 5195.37 *
Elev. 5199.36 *
Wall Mounted Lighting (WML) 9 Locations Req'd, See Plan.
Approximate existing ground line at P.G.L.
Existing ground Line at West edge of Bridge
35" ø Irrigation Line
72" ø Sanitary Sewer
SECTION (Taken at Profile Grade Line)
* Finished roadway elevation.
** Profile of Existing N. to W. Ramp Requires Modification to Achieve 16'-6" Min. Vert. Clearance. See Roadway Plans.
DIVISION OF HIGHWAYS
I 25 OVER I 70 WESTBOUND
GENERAL LAYOUT
DESIGNER H. J. Meheen
DETAILER J. Rausch
STRUCTURE NUMBERS E-16-GC
DRAWING NUMBER 8 2 OF 32 DRAWINGS

P.E. UNDER IR 25-2(193)

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
VIII	COLORADO	IR 25-2(215)	1

AS CONSTRUCTED		
NO REVISIONS	REVISED	VOID

REVISIONS		

STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS—STATE OF COLORADO

AS CONSTRUCTED PLAN AND PROFILE ~~OF PROPOSED~~

FEDERAL AID PROJECT NO. IR 25-2(215)

STATE HIGHWAY NO. 25

DENVER COUNTY

SCALES OF ORIGINAL DRAWINGS
ON PLAN
ON PROFILE VARIES
GRADE LINE ON PROFILE IS SHOWN AS GRADE OF FINISHED ROAD

*LENGTH AND DESIGN DATA

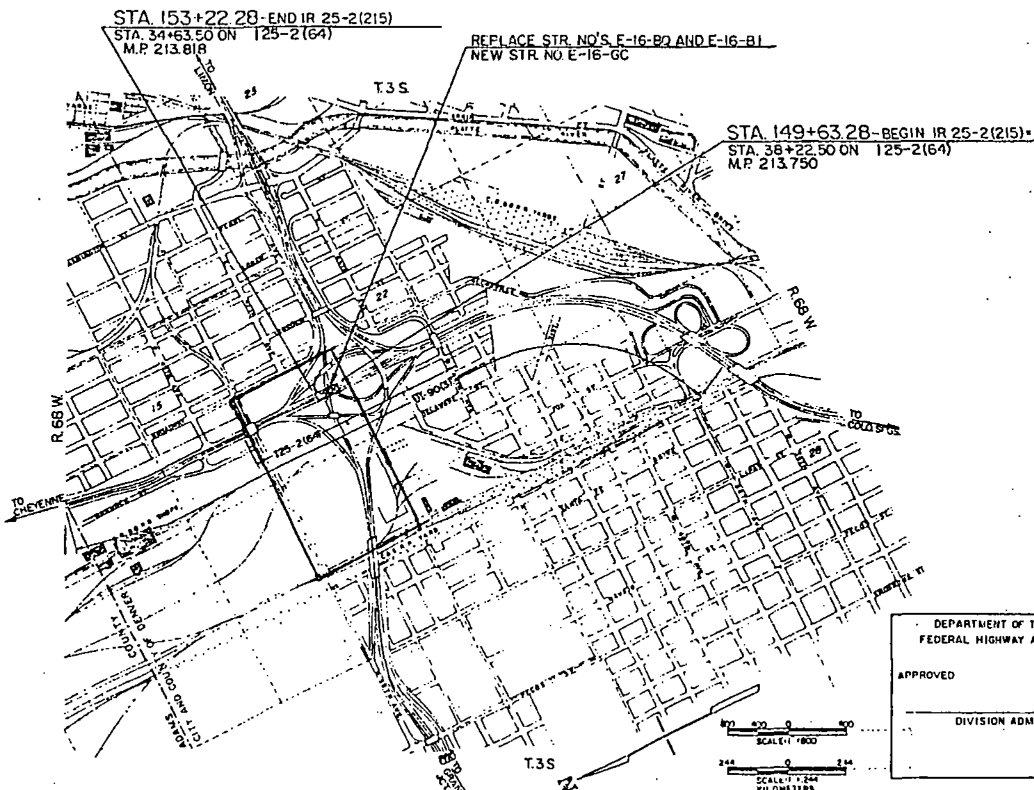
STATION		LINEAR FEET MAJOR STRUCTURE
149+63.28	BEGIN IR 25-2(215)- BEGIN MAJOR STRUCTURE NO. E-16-GC*	
38+22.50	ON I 25-2(64)	359.00
153+22.28	END MAJOR STRUCTURE NO. E-16-GC- END IR 25-2(215)*	
34+63.50	ON I 25-2(64)	

TOTALS		
SUMMARY	LIN. FT	MILES
MAJOR STRUCTURE	359.00	00680
PROJECT NET & GROSS LENGTH	359.00	00680

DESIGN DATA

MAXIMUM GRADE	3.860%
MINIMUM SSD (VERTICAL)	465 FT.
MINIMUM SSD (HORIZONTAL)	>450 FT.
MAXIMUM DESIGN SPEED (VERTICAL)	55 M.P.H.
MAXIMUM DESIGN SPEED (HORIZONTAL)	>55 M.P.H.
2007 DESIGN TRAFFIC VOLUME	DHV=18,240 ADT=182,380 TRUCKS=9%

*LENGTH BASED ON STRUCTURE ONLY. 1,491.00 LINEAR FEET OF ROADWAY LENGTH REQUIRED FOR APPROACHES.



INDEX OF SHEETS

DIVISION OF HIGHWAYS

APPROVED: Robert L. Clevenger 8/31/87
CHIEF ENGINEER DATE

AS CONSTRUCTED INFORMATION

CONTRACTOR A.S. HORNER
Project ENGINEER Steven Lewis
(Project or Resident)
PROJECT STARTED November 4 1987
PROJECT COMPLETED [illegible]

[illegible]

TITLE DATE 2-23-[illegible]

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED DATE

DIVISION ADMINISTRATOR

20771

18594

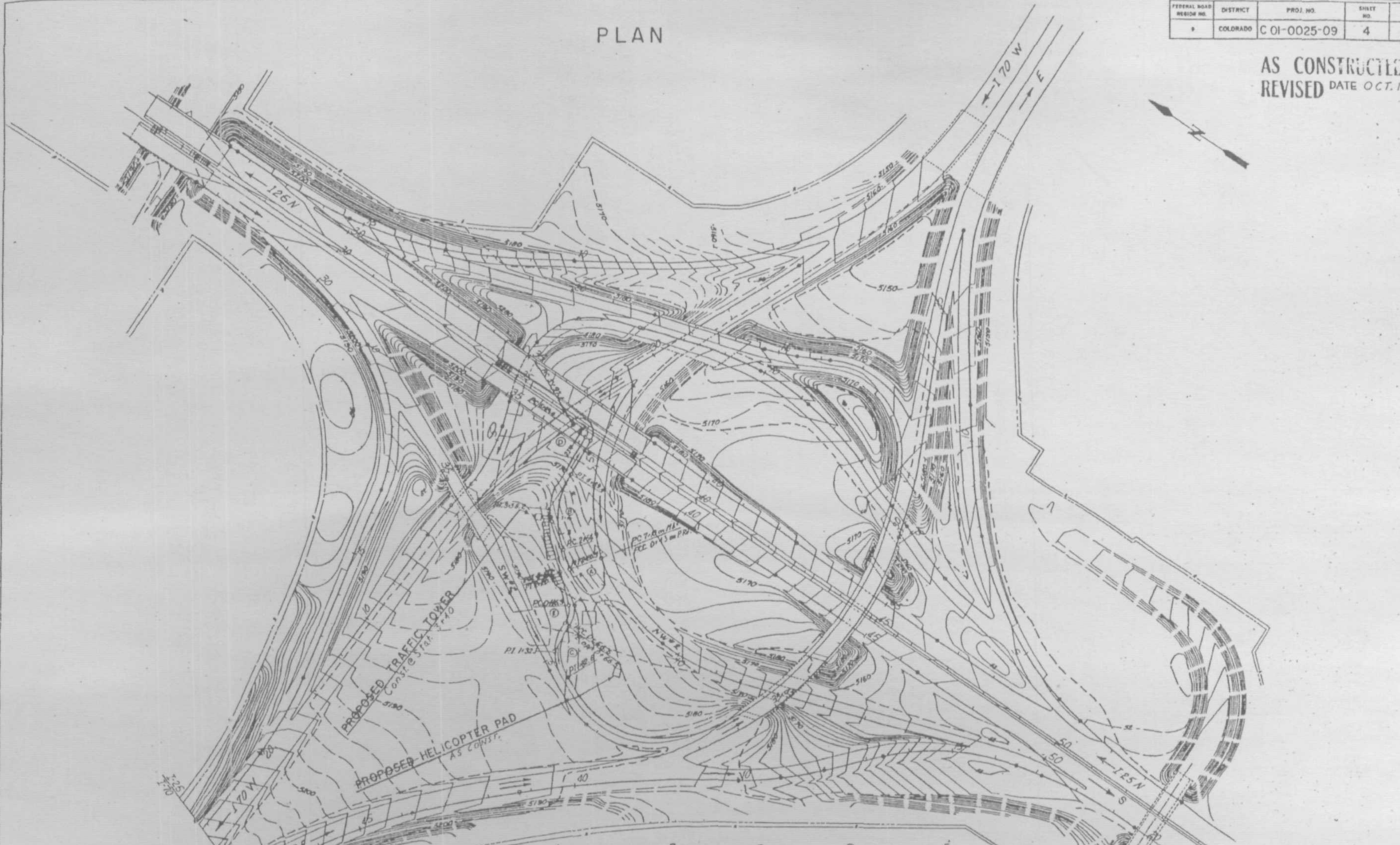
24137
7/31/87

R.J.A. DIST. VI - CDL

FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	C 01-0025-09	4	33

AS CONSTRUCTED
REVISED DATE OCT. 13, 1971

PLAN



A	B	C	D	E
R_l = 130'	Δ = 50°	Δ = 66°30'	Δ = ~~155°~~ 161°13.5'	Δ = 57°30'
R_s = 30'	D = 28°39'	D = 57°30'	D = ~~229°12'~~ 173°37'	D = 114°36'
L = 81'	T = 93.3'	T = 65.6'		T = 27.4'
Δ_l = 26°29'30'	L = 174.5'	L = 116.1'	L = ~~67.7~~ 91.6'	L = 50.2'
Offset = 10.5'	R = 200'	R = 100'	R = ~~25~~ 33'	R = 50'

Note: See Sheet No. 6 for Additional Measurements.

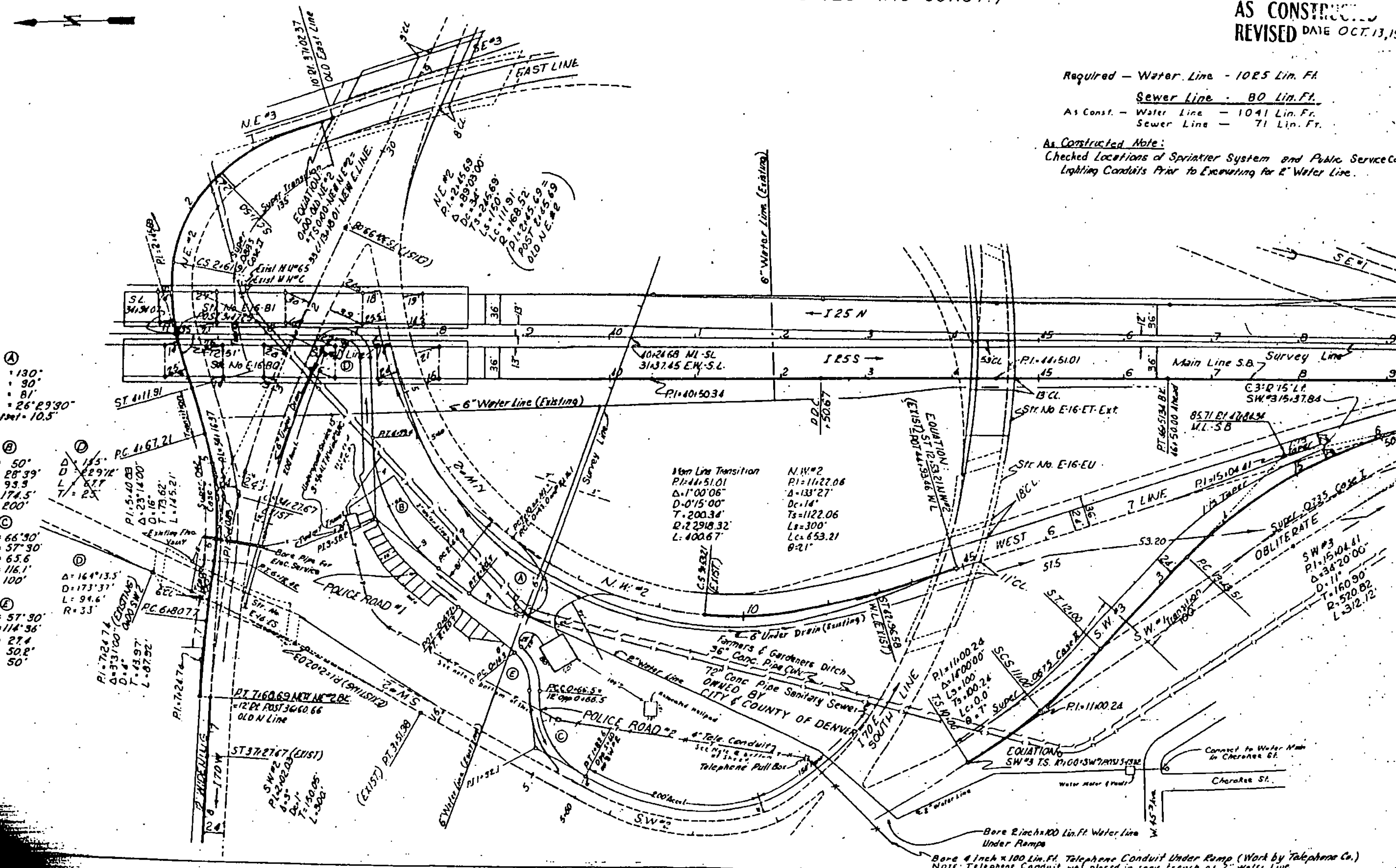
DETAILS OF WATER AND SEWER LINES (AS CONST.)

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	C 01-0025-09	6	33

AS CONSTRUCTED
REVISED DATE OCT. 13, 1971

Required — Water Line - 1025 Lin. Ft.
Sewer Line - 80 Lin. Ft.
As Const. — Water Line — 1041 Lin. Ft.
Sewer Line — 71 Lin. Ft.

As Constructed Note:
Checked Locations of Sprinkler System and Public Service Co. Lighting Conduits Prior to Excavating for 2" Water Line.



Paul Bergstrom

From: Barbara O'Grady [Barbara.Ogrady@state.co.us]
Sent: Tuesday, February 01, 2005 2:52 PM
To: pbergstrom@knightpiesold.com; walter@syrres.com
Cc: Ketellapper.Victor@epamail.epa.gov
Subject: RE: VBI70 OU3

Linda Trzyna at CDOT has a few environmental documents that may be of interest. It would be easiest if you call her directly at 303-757-9933. She spouts off all these intersections (one was 46th and Pecos, which is nearby). There are many others related to the mousetrap area.

There are construction plans available as well and are in Linda's office. Again, you would have to go there to look at them.

I will pass the VCUP report to Victor tomorrow as well as the CD containing the GW data from Globe 1993-current.

I have requested our own records on the I-25 Corridor. They should arrive tomorrow. I'll let you know if there is anything interesting enough to warrant a field trip over here.

I think these references are worth a look.
Barb

Barbara O'Grady
State Project Manager
Hazardous Materials and Waste Management Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, CO 80246-1530
303-692-3395 Phone
303-691-7878 Fax

02/04/06 WORKS MON - THURS. LEFT VOICE MAIL TO CALL TO meet on MONDAY
0830 Feb. 7. 02/04/05

1415 Linda called from Home. She can meet us on TUE: Afternoon After 1:00 p.m. I set an appt. for 1330 hrs at her office at 2000 S. Holly (Holly & Evans). Enter through South Parking lot to get checked in. Linda will call next week to confirm time!

02/10/05 1100 Linda still out sick ("major" health problems - can't use computer). She anticipated being in on 02/14. I'll call here then in a.m. to set something up.

02/22/05 meet today @ 0900 in Her office

2000 S. HOLLY
HOLLY & EVANS
South Parking Lot
Enter BLDG. and She will Escort us.

Knight Piésold and Co.

1050 Seventeenth St., Suite 450, Denver, CO 80265-2011
Telephone: (303) 629-8788
Fax: (303) 629-8789

Environmental Project Manager CDOT Region VI
PROJECT Argo Smelter Linda Tryzna JOB No. DV102.00124.01
CALCULATIONS FOR REF. DRGS. SHEET No. 1 of 1
DESIGNED J. Kunkel DATE 02/22/05 CHECKED DATE

CDOT PLANS

(1) MP 213.62 - 215.24 I-25 median I-70 to 58th Ave
As constructed no revisions 7/24/74 No Info.

(2) MP 213.97 I-25 48th Ave Bridge widening
As constructed no revisions 11/22/74 No Info.

(3) MP 213.80 I-25 @ I-70
As constructed with revisions 10/28/75 No Info

✓ (4) MP 213.77 I-25 @ I-70 Police Tower
As constructed no revisions 10/13/71 Copy SHT 6 of 33
6/3/72

✓ (5) MP 213.75 I-25 over I-70 WB
10/13/89 Copy SHT 18 of 94
As constructed P&P 11/1989 SHT 19 of 94

(6) MP 213.74 I-25 & I-70
03/16/83 No Info

✓ (7) MP 213.62 - 213.74 I-25/I-70 Interchange Copy SHT 49, 21, 12
As constructed 5/25/64 Copy Cover SHEET
46th Avenue / I-70 E.B. (sht 49) STR. E-16-ET
~~46th Avenue / I-70 E.B & W.B (sht 61) STR E-16-EQ/E-16-EV~~
1948 TEST HOLE DATA
46th Avenue / I-70 (SHT 12) STR E-16-EH/ER
" (SHT 21) STR E-16-EI

✓ (8) MP 213.76 - 215.04 I-25 48th to 52nd Ave copy sheets
As constructed 6/4/93 38, 39, 40, 71,
Revised Structure E-16-NX 72, 110, 111, 112,
120, 121, 122

Knight Piésold and Co.
1050 Seventeenth St., Suite 450, Denver, CO 80265-2011
Telephone: (303) 629-8788
Fax: (303) 629-8789

PROJECT Argo Smelter JOB No DV102 00124.01
CALCULATIONS FOR REF. DRGS. SHEET No.
DESIGNED J. Kurkel DATE 02/23/05 CHECKED DATE

Estimate ELEV. of SHALE (Claystone BEDROCK)/ALLUVIUM CONTACT AT I-25 NEAR 48th Avenue.

Source	ELEV SHALE/ALLUVIUM INTERFACE
MP 213.76 — 215.04 STA 501 +65 ± DWG. SHEET 40 of 224	5178
MP 213.62 - 213.74 TEST HOLE #119	5174
MP 213.62 - 213.74 TEST HOLES #8 & #9	5174 (WEST) 5178 (EAST)

Estimate ELEV of Highway (I-25) NR. 48th Avenue

MP

I2 - Screening Level Assessment of Metal Loading to the South Platte River

I2-1 Screening Level Estimates of Metal Loading to the South Platte River from Groundwater Sources Associated with the VBI70 OU3 and Globe Plant Sites (Knight Piesold, 2006)

I2-2 Additional Screening Level Estimates (Includes Present Conditions 2000 – 2004) (SRC, 2006)

I2-1

SCREENING LEVEL ESTIMATES OF METAL LOADING TO THE SOUTH PLATTE RIVER FROM GROUNDWATER SOURCES ASSOCIATED WITH THE VBI70 OU3 AND GLOBE PLANT SITES (KNIGHT PIESOLD, 2006B)

Knight Piésold
CONSULTING

Memorandum

Date: May 30, 2006 DV10200252.01

To: Jennifer Walter, Syracuse Research Corporation

From: Cory Conrad, Ph.D., R.G.

Cc: Paul Bergstrom

Re: **Hypothetical Screening Level Estimates of Metals Loading to the South Platte River from Groundwater Sources Associated with the VBI70 OU3 and Globe Plant Sites**

1.0 Introduction

This report is prepared according to the statement of work (SOW) issued to Knight Piésold and Co. (Knight Piésold) on May 10, 2006 by Syracuse Research Corporation (SRC). The SOW specifies "a preliminary, rough, screening level estimate..." of metals loading (cadmium and zinc) from the VBI70 OU3 site and the Globe Plant site to the South Platte River and resulting incremental concentrations from each site in the South Platte River.

It is noted that the screening level estimates of surface water concentrations must be described as hypothetical. It is currently a hypothetical assumption that metals loads in either of the two plumes in the alluvium west of the South Platte River impact the river. The best available study in this area is the ASARCO Inc. and Sate of Colorado Joint Study, Remedial Investigation Report (RI) in 1988 (ASARCO, 1988). The 1988 RI report concluded that "Releases of metals from the Globe Plant site...appear to have had little impact on the South Platte River water quality." (See p. 11 in the Executive Summary of ASARCO, 1988.)

The calculation methodology in the 1988 RI, for example, on p. 5-51 (ASARCO, 1988), is considered to be in a hypothetical manner that may be described as "assuming this... then that...". For example, quoting from the RI report, "based on a typical cadmium concentration...the resulting increase in cadmium concentrations is calculated to be...insignificant and non-detectable...". The logic is extended to a generalization about actual conditions without stating any facts that lead to the actual condition. For example, "on occasion when river flows are low...there may be temporary measurable increases...such as June 17, 1986 [that] appear to be infrequent, temporary and localized." It is noted that within this sequence of assumptions there has not been an assertion based on any evidence or mechanism (such as a gaining reach of the river) that cadmium from the groundwater plume was transferred to the river. Thus, while there was (and continues to be) circumstantial evidence that a groundwater plume from the Globe Plant site may be impacting the river, the data in the 1988 RI were apparently not considered sufficiently definitive to enable description of a definite pathway from groundwater to the river.

2.0 Available Data

2.1 The 1988 RI Report (ASARCO, 1988) developed a series of map figures depicting groundwater elevations and groundwater concentrations of contaminant metals for the time period August 27, 1987 through March 22, 1988. Plate 4.10 (ASARCO, 1988) depicts cadmium concentrations at wells and isoconcentration contours for the plume downgradient from the Globe Plant site and the plume east of the VBI70 OU3 site. Plate 4.14 depicts similar concentrations at wells and isoconcentration contours for zinc. Previous figures prepared by Knight Piésold have reproduced the cadmium and zinc isoconcentration contours from the 1988 RI for the plume east of the VBI70 OU3 site. The plumes have been slightly modified to extend southward to the location of Interstate 70, but the eastern and western lateral extents have always been presented as in the RI. The 1988 RI also contains extensive sections on groundwater and surface water investigations (Sections 4 and 5, respectively) with tables and appendices giving hydraulic conductivity determinations and well boring logs. An earlier version of the RI Report, dated December 26, 1986, contains a map figure depicting water table elevations on November 14, 1986.

2.2 In 2004 and 2005, Knight Piésold conducted groundwater investigations at the VBI70 OU3 site and in the alluvium immediately east of the site and west of South Platte River. Four wells (GW-17, GW-15, GW-16, and GW-46) are located upgradient of the Globe Plant site and downgradient (east) of the VBI70 OU3 site. Well GW-46 was installed by ASARCO/State of Colorado after the 1988 RI. A sampling round with metals analyses confirmed the continued existence of the VBI70 OU3 cadmium and zinc groundwater plumes with slightly higher cadmium concentrations than reported in the 1988 RI. In 2005, the locations and elevations of the above four wells were re-surveyed to allow updating of the hydraulic gradient determination in the Platte Valley alluvium. The update extends southward of the region with a calculated hydraulic gradient from that presented in the 1988 RI (1986 map) to the area due east of the VBI70 OU3 site. The 1986 map with updated water table elevation contours was previously distributed by Knight Piésold.

2.3 Additional information on the lateral extent of the Platte Valley alluvium is available in a U.S. Geological Survey (USGS) publication (Robsen, 1996).

2.4 As part of the SOW for this report, SRC provided two datasets in electronic spreadsheet formation, as follows:

- The spreadsheet entitled "USGS_MeanStreamflow_1982-2005.xls" that contains daily mean discharge values in cubic feet per second (cfs) for the time period January 1982 through September 2005

- The spreadsheet entitled "2^nd 2004.xls" that contains analyzed cadmium and zinc concentrations sampled from various Globe Plant site wells over the time period September 1993 through June 2004

3.0 Methodology

The objective of the following calculations is to provide screening level estimates for the mass loading and incremental concentrations in the South Platte River from the VBI70 OU3 site and the Globe Plant site. As detailed in the introduction, the estimates must be categorized as hypothetical because it uses an approach that replicates the methodology in the 1988 RI.

As part of the SOW, SRC provided an electronic spreadsheet entitled "LoadingCalcs_GlobeRI_v1.xls" that contains the following requested information:

- Proposed equations(s) for the computation(s) and definition of the variables in the equation(s)

- Description and summary table of data used to parameterize each equation variable

- Summary table of mass load and incremental concentrations for each site at two flow regimes (low and "typical"), with uncertainty to be gauged (by SRC) on the basis of both a "best estimate" and a conservative "upper bound" estimate for each flow regime.

Tables 1 and 2 of this report are slightly modified from the SRC spreadsheet in order to present the information exactly as requested in the SOW. Assumptions and professional judgments used together with the above computations/variables/parameterizations are provided in narrative format in Section 4, below.

The methodology is as follows:

- Flow in the groundwater plume is calculated using a conventional Darcian flux calculation over the width of the plume, the average saturated thickness of the aquifer, and the hydraulic gradient (see Equation 1, Table 1)

- The corresponding groundwater mass load is calculated from the groundwater flow multiplied by the assumed average plume concentration (see Equation 2, Table 1)

- The impacted surface water concentration is calculated by assuming conservative mixing of groundwater with a specified flow and associated concentration in the river (see Equation 3, Table 2); note that the conservative mixing equation is simply the concentration in the two end-members weighted by their respective flows, normalized to the combined flow

- The incremental surface water concentration is the upstream-downstream difference in concentrations

- It is noted that the incremental concentration is exactly equivalent to the concentration derived from the groundwater mass load normalized to the combined flow (see Equation 4, Table 2); because the groundwater flow is negligible with respect to surface water flows, the incremental concentration for any surface water flow may be closely approximated by normalizing the groundwater mass load to the surface water flow.

The cadmium and zinc mass loads in the VBI70 OU3 plume can also be estimated using data in the RI report. Hypothetical surface water concentrations can be calculated. Thus, comparative loads and concentrations in surface water which can be attributed to each site can be calculated according to the assumption of conservative mixing of groundwater and surface water. Finally, upper bound estimates may be made using maximum observed plume concentrations.

4.0 Calculations and Results

The following assumptions have been made using professional judgments according to time allotted for corresponding tasks in the SOW:

- The best estimates are those made within the 1988 RI for the Globe Plant; the best estimates for the VBI70 OU3 site will be made using RI methods and contemporaneous data, and upper bound estimates will keep all parameters the same except for average plume concentrations.

- Since there is no scope for determining probabilistic surface water flow regimes according to conventional hydrologic practice, the dataset of mean daily flows has been trimmed to the time period October 1, 1982 through September 30, 2005 and analyzed using non-parametric (percentile) formulas. A reasonable low flow is considered the 15th percentile measurement, which is 10 cfs; a typical flow value is considered the median (50th percentile) measurement, which is 62 cfs.

- Since there is no scope for plotting concentrations at wells, time series at wells, or contouring plumes, the definitions of plume widths, past and present, will be as depicted on the map-plates in the RI.

- The exact method for integrating the Globe Plant site cadmium plume is not given in the RI; therefore, for the Globe Plant site plume, the average cadmium plume concentration estimated in the RI will be expressed as a ratio to the contemporaneous concentration at well GW-29, which had the peak concentration in 1988; the ratio is 0.679.

- Given the ratio of average plume concentration to maximum well concentration for the Globe Plant Site plume, the VBI70 OU3 plume average cadmium concentration in 1988 will be estimated using the same ratio and the 1988 concentration at well GW-15.

- The only parameter that will be varied to determine upper bound estimates will be the cadmium concentrations at well GW-29 (Globe) and GW-15 (VBI70 OU3); the historical maximum concentrations will be substituted to calculate upper bound, average plume concentrations using the same ratios described above.

- For zinc, there is no average concentration estimated in the 1988 RI; despite having a somewhat different shape compared to the cadmium plume, there is no scope for separately determining zinc plume parameters. Therefore, average and upper bound concentrations for zinc in the Globe Plant site and VBI70 OU3 plumes will be estimated exactly as for cadmium but will substitute contemporaneous (1988) and historical maximum zinc measurements at wells GW-29 and GW-15/GW-16 (whichever is greater is for zinc).

- For both plumes, the hydraulic conductivity that will be assumed is 28.35 feet per day (ft/day). This is based on the assumption in the 1988 RI of a value of 1×10^{-2} cm/sec for the Platte Valley alluvium. The hydraulic gradient of 0.002 that will be assumed is also from the 1988 RI.

4.1 For the Globe Plant site plume, the following parameters are determined from the 1988 RI and the additional data described above:

• Plume width	550 feet
• Saturated thickness	25 feet
• Hydraulic gradient	0.002
• Average cadmium plume concentration	1.5 mg/l Cd
• Contemporaneous cadmium concentration at well GW-29	2.21 mg/l Cd
• Contemporaneous zinc concentration at well GW-29	1.37 mg/l Zn
• Historical maximum cadmium concentration at well GW-29	22.8 mg/l Cd
• Historical maximum zinc concentration at well GW-29	4.74 mg/l Zn

From the above information, the upper bound cadmium concentration in the plume is determined to be 15.5 mg/l. The average and maximum zinc concentrations in the plume, respectively, are determined to be 0.93 and 3.21 mg/l.

4.2 For the VBI70 OU3 plume, the following parameters are determined from the 1988 RI and the additional data described above:

• Plume width	700 feet
• Saturated thickness	25 feet
• Hydraulic gradient	0.002
• Contemporaneous cadmium concentration at well GW-15	0.073 mg/l Cd
• Contemporaneous zinc concentration at well GW-15/16	0.213 mg/l Zn
• Historical maximum cadmium concentration at well GW-15	0.119 mg/l Cd
• Historical maximum zinc concentration at well GW-15/16	0.241 mg/l Zn

From the above information, the average cadmium concentration in the plume is determined to be 0.05 mg/l, and the upper bound cadmium concentration in the plume is determined to be 0.08 mg/l. The average and maximum zinc concentrations in the plume, respectively, are determined to be 0.144 and 0.164 mg/l.

4.3 Table 3 shows the calculated (hypothetical) mass loading and incremental concentrations in the South Platte River that may be associated with the Globe Plant site and the VBI70 OU3 plumes. The calculations assume concentrations equal to the detection limit (0.001 mg/L) for both cadmium and zinc in the South Platte River upstream of the hypothetical point of mixing with groundwater.

CC:lkr
Attachments: Tables 1-3

References

ASARCO Inc. and State of Colorado (ASARCO, 1988), "Draft for Public Comment, Remedial Investigation Report, ASARCO Inc. and State of Colorado Joint Study, Globe Plant Site," Denver Colorado, September 20.

Robsen, S.G., 1996, "Geohydrology of the Shallow Aquifers in the Denver Metropolitan Area, Colorado," U.S. Geological Survey Hydrologic Investigations Atlas HA-736.

Knight Piésold
CONSULTING

Table 1: EQUATIONS FOR CALCULATING GROUNDWATER (DARCIAN) FLOW AND MASS LOAD

EQUATION 1: DARCIAN FLOW (Q)

Darcian Flow, $Q\ (ft^3/sec) = K * i * A * CFdf$

where:

K = Hydraulic Conductivity (ft/day)
i = Hydraulic Gradient (unitless)
A = Saturated Area (ft^2) (cross sectional area perpendicular to flow)
CF_{df} = Conversion Factor for Darcian flOW calc (day/sec)

EQUATION 2: MASS LOAD

Mass Load $(mg/s) = C_{plume}\ (mg/L) * Q\ (ft^3/sec) * CF\ (L/ft^3)$

where:

C_{plume} = Concentration of chemical in the plume (mg/L)
Q = Darcian flow (ft^3/sec), calculated as above:
CF = Conversion factor (L/ft^3)

INPUTS AND EXAMPLE CALCULATION:

PARAMETER	UNITS	VALUE	COMMENTS
C_{plume}	(mg/L)	15.5	average concentration in Globe plume (TRC 1988)
Q	(ft^3/sec)	0.009	calculated value (see "Darcian Flow Calcs")
CF	(L/ft^3)	28.31685	
MASS LOAD	**(mg/s)**	**3.960**	calculated value

EXAMPLE DARCIAN FLOW CALCULATION:

PARAMETER	UNITS	VALUE	COMMENTS
K	(ft/day)	2.835E+01	TRC (1988) range is 7.8E-06 to 1E-03 cm/s, assumed 1E-02 (or 28.35 ft.day)
i	(unitless)	0.002	TRC (1988) alluvial groundwater in floodplain
A	(ft^2)	13750	TRC (1988) saturated thickness (25 ft) x plume width near GW-59 (550 ft)
CF_{df}	(day/sec)	0.000011574	
Q	**(ft^3/sec)**	**0.009**	

Knight Piésold
CONSULTING

Table 2: CONCENTRATION INCREMENT IN SOUTH PLATTE RIVER

EQUATION 3:

$$C_{SouthPlatte}\ (mg/L) = \frac{C_{gw} * Q_{gw} + C_{SP\text{-}upgrad} * Q_{SP}}{Q_{gw} + Q_{SP}}$$

where:

C_{gw} = Concentration of chemical in groundwater (mg/L)
Q_{gw} = Flux of groundwater (cubic feet per second)
$C_{SP\text{-}upgrad}$ = Concentration of chemical in the South Platte River upgradient of the Site (mg/L)
Q_{SP} = Flux of the South Platte River (cubic feet per second)

EQUATION 4: SITE ATTRIBUTABLE CONCENTRATION INCREMENT IN THE SOUTH PLATTE:

$\Delta C_{site}\ (mg/l) = C_{SouthPlatte} - C_{SP\text{-}upgrad}$

or

$\Delta C_{site}\ (mg/l) = Mass\ Load / (Q_{SP} + Q_{gw}) / CF$

EXAMPLE INPUTS AND CALCULATION:

PARAMETER	UNITS	VALUE	COMMENTS
C_{gw}	(mg/L)	15.5	Mean plume concentration (TRC, 1988)
Q_{gw}	(cfs)	0.010	TRC (1988) (rounded up from 0.009)
C_{SP}	(mg/L)	0.001	TRC (1988) mean concentration upstream of Globe Plant detention pond outfall (=detection limit)
Q_{SP}	(cfs)	10	Mean flow during 1986 (TRC, 1988): 300 cfs Median flow rate 1982-2005: 62 cfs 15th percentile low flow rate, 1982-2005: 10 cfs
$C_{SouthPlatte}$	(mg/L)	0.016484	

EXAMPLE RESULTS:

Concentration	Units	300 cfs	62 cfs	10 cfs
$C_{SouthPlatte}$ (mg/L)	(mg/L)	0.001517	0.003499	0.016484
ΔC_{site} (mg/L)	(mg/L)	0.000517	0.002499	0.015484
ΔC_{site} (ug/L)	(ug/L)	0.517	2.50	15.5
ΔSite Mass Load (mg/sec)	(mg/sec)	4.389	4.389	4.389

Table 3: SUMMARY OF ESTIMATED MASS LOADING AND INCREMENTAL CONCENTRATIONS IN THE SOUTH PLATTE RIVER FROM VBI70 OU3 (ARGO SMELTER) AND GLOBE PLANT SITES

SITE	PARAMETER	MASS LOADING		INCREMENTAL CONCENTRATION			
				Low Flow (10 cfs)		Typical Flow (62 cfs)	
		RI Estimate (mg/sec)	Upper Bound (mg/sec)	RI Estimate (ug/L)	Upper Bound (ug/L)	RI Estimate (ug/L)	Upper Bound (ug/L)
VBI70 OU3	Cadmium	0.016	0.025	0.05	0.09	0.01	0.01
	Zinc	0.045	0.051	0.16	0.18	0.03	0.03
Globe Plant	Cadmium	0.425	4.389	1.50	15.5	0.24	2.50
	Zinc	0.263	0.909	0.93	3.21	0.15	0.52

I2-2

ADDITIONAL SCREENING LEVEL ESTIMATES
(INCLUDES PRESENT CONDITIONS: 2000 – 2004)
(SRC, 2006)

This file summarizes information provided by Knight Piesold in their 5/30/06 Memorandum with the addition of 2 analysis based on current (2000-present) groundwater data from the Globe floodplain plume and the floodplain alluvium east of the VBI70 OU3 site.

These 2 additional scenarios were calculated using the same methods specified in the 5/30/06 memorandum; the only difference being the input concentrations.

Absolute Estimates	This tab contains a modified version of Table 3 of the 5/30/06 memorandum to include 2 additional scenarios (current "best case" and "upper bound").
Relative Estimates	This tab contains a table summarizing the contribution of the VBI70 OU3 site to mass loads and concentrations in the South Platte River, relative to the estimated loads and concentrations coming from the Globe Plant Site.
Current Data 2000-present	This tab contains the data used to calculate the mean and max groundwater concentrations in the Globe floodplain plume and the floodplain alluvium east of the VBI70 OU3 site for the 2 "current conditions" scenarios.

SUMMARY OF ESTIMATED MASS LOADING AND INCREMENTAL CONCENTRATIONS IN THE SOUTH PLATTE RIVER FROM VBI70 OU3 (ARGO SMELTER) AND GLOBE PLANT SITES

SITE	CHEMICAL	MASS LOADING (mg/sec)				INCREMENTAL CONCENTRATION (ug/L)							
						Low Flow (10 cfs)				Typical Flow (62 cfs)			
		Historical		Current Conditions *(2000-present)*		Historical		Current Conditions *(2000-present)*		Historical		Current Conditions *(2000-present)*	
		RI Estimate *(1988)*	Upper Bound *(1988-present)*	Best Estimate *(mean conc.)*	Upper Bound *(max conc.)*	RI Estimate *(1988)*	Upper Bound *(1988-present)*	Best Estimate *(mean conc.)*	Upper Bound *(max conc.)*	RI Estimate *(1988)*	Upper Bound *(1988-present)*	Best Estimate *(mean conc.)*	Upper Bound *(max conc.)*
VBI70 OU3	Cadmium	0.016	0.025	0.013	0.036	0.05	0.09	0.04	0.11	0.01	0.01	0.006	0.018
	Zinc	0.045	0.051	0.033	0.130	0.16	0.18	0.10	0.40	0.03	0.03	0.016	0.064
Globe Plant	Cadmium	0.425	4.389	0.110	1.472	1.50	15.5	1.29	21	0.24	2.50	0.21	3.39
	Zinc	0.263	0.909	0.198	0.963	0.93	3.21	1.90	9.74	0.15	0.52	0.31	1.57

RELATIVE ESTIMATES OF MASS LOADS TO AND INCREMENTAL CONCENTRATIONS IN THE SOUTH PLATTE RIVER

A. CADMIUM

Scenario			Relative Mass Load (%) (VBI70 OU3/Globe)	Relative Incremental Concentration (%) (VBI70 OU3/Globe)	
Case ID	VBI70 OU3 Input Concentration	Globe Input Concentration		Low Flow (10 cfs)	Typical Flow (62 cfs)
A	Current-Best Estimate	Current-Best Estimate	12%	3%	3%
B	Current-Upper Bound	Current-Upper Bound	2.4%	1%	1%
C	Current-Upper Bound	Current-Best Estimate	32%	8%	8%
D	RI Estimate (1988)	RI Estimate (1988)	4%	4%	4%
E	Historical - Upper Bound	Historical - Upper Bound	1%	1%	1%
F	Historical - Upper Bound	Historical - RI Estimate (1988)	6%	6%	6%

B. ZINC

Scenario			Relative Mass Load (%) (VBI70 OU3/Globe)	Relative Incremental Concentration (%) (VBI70 OU3/Globe)	
Case ID	VBI70 OU3 Input Concentration	Globe Input Concentration		Low Flow (10 cfs)	Typical Flow (62 cfs)
A	Current-Best Estimate	Current-Best Estimate	16%	5%	5%
B	Current-Upper Bound	Current-Upper Bound	14%	4%	4%
C	Current-Upper Bound	Current-Best Estimate	66%	21%	21%
D	RI Estimate (1988)	RI Estimate (1988)	17%	17%	17%
E	Historical - Upper Bound	Historical - Upper Bound	6%	6%	6%
F	Historical - Upper Bound	Historical - RI Estimate (1988)	19%	19%	19%

APPENDIX J – WELL DATA

J1 – Colorado Division of Water Resources Database - Data for Zip Code 80216
J2 – Colorado Division of Water Resources Database – Data Field Definitions
J3 – Colorado Department of Health - 1992 Well Survey Results

APPENDIX J1

Colorado Division of Water Resources Database
Data for Zip Code 80216

*See **qry_Zip_80216.xls** file on Attached CD*

APPENDIX J2

Colorado Division of Water Resources Database
Data Field Definitions

WELL SYSTEM DATA FIELDS

Field Header	**Definition**
receipt	The receipt number is the number assigned when the fee is paid. The entire receipt number is eight numeric characters followed by one alphabetic character (if required).
div (Division)	Numeric identifier for Water Division (1-8) in which the well is located.
cty (County)	Numeric identifier for Colorado counties (1-63) in which the well is located:

COLORADO COUNTIES NUMERICAL CODE:

ADAMS	01
ALAMOSA	02
ARAPAHOE	03
ARCHULETA	04
BACA	05
BENT	06
BOULDER	07
BROOMFIELD	64
CHAFFEE	08
CHEYENNE	09
CLEAR CREEK	10
CONEJOS	11
COSTILLA	12
CROWLEY	13
CUSTER	14
DELTA	15
DENVER	16
DOLORES	17
DOUGLAS	18
EAGLE	19
ELBERT	20
EL PASO	21
FREMONT	22
GARFIELD	23
GILPIN	24
GRAND	25
GUNNISON	26
HINSDALE	27
HUERFANO	28
JACKSON	29
JEFFERSON	30
KIOWA	31
KIT CARSON	32
LAKE	33
LA PLATA	34
LARIMER	35
LAS ANIMAS	36
LINCOLN	37
LOGAN	38
MESA	39
MINERAL	40
MOFFAT	41
MONTEZUMA	42
MONTROSE	43
MORGAN	44
OTERO	45
OURAY	46
PARK	47
PHILLIPS	48
PITKIN	49
PROWERS	50
PUEBLO	51
RIO BLANCO	52
RIO GRANDE	53
ROUTT	54
SAGUACHE	55
SAN JUAN	56
SAN MIGUEL	57
SEDGWICK	58
SUMMIT	59
TELLER	60
WASHINGTON	61
WELD	62
YUMA	63

permitno (Permit Number)	The well permit number (numeric).
permitsuf (Permit Suffix)	A character field for the well suffix code that follows the permit number.
Permitrpl	Identifier indicating a well's replacement.
actdate	Date well permit application received.

actcode

The activity code states status of permit application file:

Code	*Desc*
AP =	New application received.
AD =	Application denied. Denial number entered in permit number field and date entered in permit issued date field.
AW =	Application for a permit is withdrawn. Code and date also entered to status code and date fields.
AV =	Verbal approval granted to well construction contractor to construct a well without a permit in place (emergency only).
CA =	Canceled well permit. Code and date also entered to status code and date fields.
CD =	Change description of acres irrigated (designated basins). Entered to status and date fields of existing record upon receipt of application.
CO =	Application to commingle wells (designated basins). Entered to status and date fields of existing record upon receipt of application.
CP =	Amended household use permit to allow watering of user's noncommercial domestic animals.
EX =	Well permit expiration date extended.
MH =	Monitoring hole notice of construction. MH file number and date entered in permit number and permit date fields.
NP =	Well permit issued. Permit number and issue date entered in permit number and permit date fields.
TH =	Test hole notice. Replaced by MH notice in 1988.
TW =	Test well. Replaced by MH notice in 1988.

wd

A character field which indicates the Water District in which the well is located (1-80). Defined as a basin on minor drainage within the Water Division.

basin

When applicable, a character field indicating the Designated Groundwater Basin Number (1-8):

<u>DESIGNATED BASINS</u>

NORTHERN HIGH PLAINS	01
KIOWA-BIJOU	02
SOUTHERN HIGH PLAINS	03
UPPER BLACK SQUIRREL CREEK	04
LOST CREEK	05
CAMP CREEK	06
UPPER BIG SANDY	07
UPPER CROW CREEK	08

md

A character field indicating the Designated Groundwater Basin Management District Number (1-13):

<u>MANAGEMENT DISTRICTS (BASINS)</u>

PLAINS	01
SAND HILLS	02
ARIKAREE	03
FRENCHMAN	04
CENTRAL YUMA	05
W – Y	06
NORTH KIOWA-BIJOU	07
EASTERN CHEYENNE	08
LOST CREEK	09
SOUTHERH HIGH PLAINS	10
MARKS BUTTE	11
UPPER BLACK SQUIRREL	12
UPPER BIG SANDY	13

full name	Applicant name (character field).
address1	A character field for the street portion of the primary mailing address of the permit holder.
address2	A character field for the street portion of a secondary mailing address if submitted.
city	A character field for the City of the primary mailing address.
state	A character field for the State of the primary mailing address
zip1	A character field for the primary zip code.
zip2	A character field for a secondary zip code, if provided.
phone_number	A character field for Applicant's phone number.
pm	Principal Meridian in which well is located (S = Sixth, N = New Mexico, U = Ute, C = Costilla, B = Baca).
rng (Range)	Numeric field for the Range in which well is located.
Rnga	Identifies half ranges ("H")
Rdir	Identifies direction (E, W)
ts (Township)	Numeric field for Township in which well is located.
Tsa	Identifies half ranges ("H")
Tdir	Identifies direction (N, S)
sec (Section)	Numeric field for Section in which well is located (1-36).
Seca	Reserved for locations containing a U in the section number.
QTR160	Character field for quarter section (160 acre quarter) in which well is located.
QTR40	Character field for the quarter-quarter section (40 acre quarter of 160 acre quarter) in which well is located.
QTR10	Character field for the quarter-quarter section (10 acre quarter of 40 acre quarter) in which well is located.
coordsns	Distance (feet) from the north or south section line to the well location.
coordsns_dir	Identifies which section line (N,S) from which distance is measured.
coordsew	Distance (feet) from the east or west section line to the well location.
coordsew_dir	Identifies which section line (E,W) from which distance is measured.
AQUIFER1	Aquifer in which well is located.

AQUIFER CODES:

GW	ALL UNNAMED AQUIFERS
KA	ARAPAHOE

UKA	UPPER ARAPAHOE	
LKA	LOWER ARAPAHOE	
JMB	BRUSHY BASIN	
KDB	BURRO CANYON	
KCH	CHEYENNE	
CON	CONFINED	SAN LUIS VALLEY
KD	DAKOTA	
TDW	DAWSON	
UTDW	UPPER DAWSON	
LTDW	LOWER DAWSON	
TKD	DENVER	
JE	ENTRADA	
TG	GREEN RIVER	
PH	HERMOSA	
KI	ILES	
KL	LARAMIE	
KLF	LARAMIE FOX HILLS	
ML	LEADVILLE LIMESTONE	
KM	MANCOS	
KMV	MESA VERDE GROUP	
JM	MORRISON	
TO	OGALLALA	
KP	PIERRE SHALE	
KPU	PURGATOIRE	
JMS	SALT WASH	
UNC	UNCONFINED	SAN LUIS VALLEY
TW	WASATCH	
TW	WHITE RIVER	
KW	WILLIAMS FORK	

AQUIFER2 name of second aquifer if well is known to be multiply completed.

subdiv_name Subdivision name.

lot Lot number in subdivision.

block Block number in subdivision.

filing Filing number.

engineer Engineer who approved permit.

well_name Owners's well designation number or name.

Use1 & Use2 Codes for well Uses:

Data Code	Use Description
1	Crop Irrigation
2	Municipal
3	COMMERCIAL
4	INDUSTRIAL
5	RECREATION
6	FISHERY
7	FIRE
8	DOMESTIC
9	LIVESTOCK
G	GEOTHERMAL
H	HOUSEHOLD USE ONLY
K	SNOWMAKING
O	OTHER
O	MONITORING HOLE/WELL
R	RECHARGE
E	EXCHANGE AND AUGMENTATION
Q	=O (Other, or Monitoring Hole/Well)

Use3

CODE	TYPE
A	AUGMENTATION. All wells in augmentation plans are coded with an "A" in the last position. First position is the actual use of the well.
M	MONITORING WELL (PERMITTED). The first position is "O" followed by "M" in the last position.

Z	HOUSEHOLD USE WELLS ISSUED PRIOR TO HB1111 THAT HAVE BEEN AMENDED PURSUANT TO (3)(b)(II)(b) BY $25.00 APPLICATION. First position code is "H" followed by "Z" in the last position.
L	PERMIT ISSUED UNDER PRESUMPTION (3)(b)(II)(A) FOR DOMESTIC/LIVESTOCK USES AS THE ONLY WELL ON 35 ACRES. First position is either "8" domestic or "9" livestock", or both 1st and 2nd followed by "L" in the last position.
	PERMITS ISSUED UNDER (3)(b)(I) WHERE WATER IS AVAILABLE ARE CODED FIRST POSITIONS AS NECESSARY WITH THE ACTUAL USE. HB1111 does not apply to these wells.
G	GRAVEL PIT WELL PERMIT. This application (PERMIT) is coded as "O" in the first position with "G" in the last position.
C	CLOSED LOOP GEOTHERMAL WELL. First position is codes as "G" for geothermal. Last position is "C".
P	GEOTHERMAL PRODUCTION WELL. First position is coded "G" for geothermal. Last position is "P".
S	OTHER TYPES OF HOLES CONSTRUCTED-ESPECIALLY FOR CATHODIC PROTECTION.
	IDENTIFIES THAT THE PERMIT WAS ISSUED PURSUANT TO SENATE BILL 5 (137 (4). First positions are for the actual use(s) of the well.

driller_lic Water well contractor's license number.

pump_lic Pump installation contractor's license number.

pidate Date the pump installation report is received by DWR.

statute Statute under which the permit was issued using the last four numbers of chapter and paragraph, i.e. 37-92-602(3)..602(3). (see www.intellinetusa.com/statmgr.htm)

statcode Interim status of the application or permit:

Code	*Desc*
AB =	Abandoned well.
AR =	Date application for permit resubmitted to DWR.
AU =	Date application returned to applicant for correction or additional information.
EP =	Expired well permit.
NS =	Exempt wells where no statement of use is required (no longer used).
PI =	Pump Installation Report received (no longer used).
PU =	Pump Installation Report returned to responsible party for correction.
RC =	Record change. A portion of the file was modified.
SA =	Statement of beneficial use accepted (no longer used in statute code).
SP =	Statement of beneficial use received (no longer used in statute code).
SR =	Statement of beneficial use resubmitted to DWR.
SU =	Statement of beneficial use returned to owner for correction.
WA =	Well construction report received (no longer used).
WU =	Well construction report returned to responsible party for correction.
WR =	Well construction report resubmitted to DWR.
ZZ =	Transaction code indicates a portion of the file was updated with general review and update of records.

statdate Date of the above status code action.

npdate Date the permit, denial (AD) or monitoring hole was issued.

wadate Date the Well Construction and Test Report was received in DWR.

trancode Activity or status code. Last action updated.

trandate Computer machine date of last update to the record.

sadate Date of first beneficial use.

sbudate Date statement of use received.

exdate	Expiration date of well permit.
abrdate	Date abandonment report received.
abcodate	Date well plugged and abandoned.
abreq	Flag if the well requires plugging and sealing upon construction of new well
acreft	Annual appropriation in acre feet.
tperf	Depth to top of first perforated casing.
bperf	Depth to base of last perforated casing.
case_no	Water court case number.
yield	Yield in gallons per minute.
depth	Total depth of well.
level	Depth to static water level.
elev	Ground surface elevation.
area_irr	Acres irrigated.
Irr_meas	Acre irrigated units
comment	Comment field
meter	Totalizing flow meter reqd., installed.
wellxno	Cross reference to another well or record.
Wellxsuf	Cross reference character field for well suffix code (follows the permit number).
Wellxrpl	Cross reference identifier indicates well replacement.
Nwcdate	Notice of Well Construction Report received (Statewide nontributary rules).
Nbudate	Notice of Commencement of Beneficial Use received (Statewide nontributary rules).
wcdate	Date well construction completed.
pcdate	Date pump installation completed
log	Flag to indicate if a geophysical is required and received.
qual	Water quality information available, y or n.
user1	Initials of last staff member to update file.
pyield	Proposed yield of well in gpm.
pdepth	Proposed depth of well.
pacreft	Proposed annual appropriation.

well_type	Calculated value to determine if record is exempt, non exempt or georthermal.
valid_permit	Calculated value to determine if a well permit is valid. (must be verified)
parcel_no	Parcel identifier
parcel_size	Parcel size in acres. Number of acres on well site.
noticedate	Notice sent to owner indicating permit about to expire. (Not yet used)
utm_x	A numeric field for the UTM-X coordinate. All UTM values are Zone 13 based on NAD83.
utm_y	A numeric field for the UTM-X coordinate. All UTM values are Zone 13 based on NAD83.
loc_source	Identifies source of UTM coordinates. If the location was obtained from the PLSS location, it is indicated by the description "SPOTTED".

d:documents/word.Well_data fields.doc (6/25/01, ebt)
Modified from wellsys.doc 1/27/97 rab.
c:officedoc.wellsys.doc

APPENDIX J3

Colorado Department of Health
1992 Well Survey Results

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Roy C + Myrna R Thomas

Street Address: 4644 Leaf Court

City, State, Zip Code: Denver Co 80216

Telephone Number (H): 296-4611
(W):

****

Years lived on property: 11

Well present on property: yes

Years well present on property: Don't Know

State Engineers well permit: yes no Permit No: Don't Know

Well depth: Don't Know Well yield:

Well construction: Don't Know

Well usage: drinking source bathing

garden irrigation other (specify)

Well is covered

Alternative water sources:

FILE: ARGO PA/

RECEIVED
APR 14 1992
HAZARDOUS MATERIALS
AND WASTE MANAGEMENT

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Sarah Wolf

Street Address: 4695 No. Lincoln St

City, State, Zip Code: Denver Colo, 80216

Telephone Number (H): 296-4271
(W):

4595 Leaf Ct

****

Years lived on property: 43 yrs prior to that lived at ~~Leaf~~ Leaf Ct from 1910 -- 1944

Well present on property: No

Years well present on property: never

State Engineers well permit: yes no Permit No:

I am 81 yrs old lived in Globeville

Well depth: Well yield:

Well construction:

Well usage: drinking source bathing

garden irrigation other (specify)

Alternative water sources:

always used City Water except the artesian well
There was a artesian well located at 4617 Leaf Ct
I was always told it was 700 ft. everyone in Globeville
would bring their containers and get water because it was
good + cold The lady who lived there is
still living she might have pictures of it
she lives at. 4730 North Lincoln St. Pauline Wolf
when I-70 was built it was destroyed this has never
been discussed in any meetings I have attended feel free to [illegible]

FILE: ARGO PA/

464

RECEIVED
MAY 05 1992
HAZARDOUS MATERIALS
AND WASTE MANAGEMENT

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Mary D. Williams

Street Address: 5394 no. Broadway (5340 No Broadway)

City, State, Zip Code: Denver Colorado 80216-1925

Telephone Number (H): (303) 296-2947
(W):

****

Years lived on property: Since 1958

Well present on property: yes ✓ no

Years well present on property: do not know

State Engineers well permit: yes no ✓ Permit No:

Well depth: do not know Well yield: —

Well construction: —

Well usage: no drinking source no bathing no

garden irrigation no other (specify)

use Denver Water

Alternative water sources:

...E: ARGO PA/

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Bomaroto Pump and Equipment

Street Address: 5055 N. Washington

City, State, Zip Code: D, CO 80216

Telephone Number (H): 295-0647
(W):

****

2 sump wells and 20' casing sealed for 6 years

Years lived on property:

Well present on property: yes no

Years well present on property:

State Engineers well permit: yes no Permit No:

Well depth: Well yield:

Well construction:

Well usage: drinking source bathing

garden irrigation other (specify)

Alternative water sources:

on city water

FILE: ARGO PA/

MAY 18 1992

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: GENIE BEEFIUL

Street Address: 707 E 50TH

City, State, Zip Code: DEN, CO, 8026

Telephone Number (H):
(W): 296-9292

****

Years lived on property: 10

Well present on property: yes X no

Years well present on property: 30

State Engineers well permit: yes no X Permit No:

Well depth: ? Well yield: ?

Well construction: ?

Well usage: NONE SEALED drinking source bathing

garden irrigation other (specify)

Alternative water sources: CITY

FILE: ARGO PA/

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: JULIA OLETSKI

Street Address: 425 E 49th AVE

City, State, Zip Code: Denver, Co 80216

Telephone Number (H): 296-4766
(W):

3 persons.

****

Years lived on property: 1937 55

Well present on property: yes no

Years well present on property: 1937

State Engineers well permit: yes no Permit No:

Well depth: 25-30' Well yield: ?

Well construction: Cased

Well usage: drinking source bathing

garden irrigation other (specify)
grass - Flowers - TREE
DO NOT USE FOR GARDEN

Alternative water sources:

well on City water 1940-82

E: ARGO PA/

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: John OLETSKI

Street Address: 4935 SHERMAN

City, State, Zip Code: Denver, CO 80216

Telephone Number (H): 296 - 4592
(W):

person 1

****

Years lived on property: 50

Well present on property: yes no

Years well present on property:

State Engineers well permit: yes no Permit No:

Well depth: 28'? Well yield:

Well construction:

Well usage: drinking source bathing

garden irrigation other (specify)

Alternative water sources:

went on city in 1940-1942

-E: ARGO PA/

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Wayne L. [illegible]

Street Address: 4700 Sherman St

City, State, Zip Code: Denver Colo 80216

Telephone Number (H): 296 4468
(W): 388-4893

****

Years lived on property: 29

Well present on property: yes no

Years well present on property: 40 yrs

State Engineers well permit: yes no Permit No:

Well depth: 75 Well yield:

Well construction:

Well usage: drinking source bathing

garden irrigation other (specify)

Alternative water sources:

City water

Never drank from well - lawn use only

Sears Installed well

FILE: ARGO PA/

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Annette Espinosa

Street Address: 541 E 56th

City, State, Zip Code: Den Co 80216

Telephone Number (H): 296-4533
(W): 986-7778

****

Years lived on property: 1 yr in June

Well present on property: yes X no

Years well present on property:

State Engineers well permit: yes no Permit No:

Well depth: Well yield:

Well construction:

Well usage: drinking source NO bathing X

garden irrigation X other (specify) water Dogs wash cloth

Alternative water sources:

FILE: ARGO PA/

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Kelborn (owner)

Street Address: 5750 N. Washington

City, State, Zip Code:

Telephone Number (H):
(W):

****

Years lived on property:

Well present on property: yes no

Years well present on property:

State Engineers well permit: yes no Permit No:

Well depth: Well yield:

Well construction:

Well usage: drinking source bathing

garden irrigation other (specify)

Alternative water sources: (Drinking - City Water)

FILE: ARGO PA/

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: MARTIN NOWICKI

Street Address: 539 E 56th Ave

City, State, Zip Code: DENVER

Telephone Number (H): (W): 295-5314

****

Years lived on property: 1½

Well present on property: yes no

Years well present on property: DON'T KNOW

State Engineers well permit: yes no Permit No:

Well depth: Well yield:

Well construction:

Well usage: drinking source bathing

garden irrigation other (specify)

Alternative water sources:

FILE: ARGO PA/

704

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Barbara Umbriaco

Street Address: 5589 N. Pearl St.

City, State, Zip Code: Denver 80216

Telephone Number (H): No phone
(W):

****

Years lived on property: Since 1939

Well present on property: yes no

Years well present on property: Since 1939

State Engineers well permit: yes no Don't Know Permit No:

Well depth: Don't Know Well yield: Don't Know

Well ~~construction~~:

Well usage: drinking source bathing

lawn ~~garden~~ irrigation other (specify)

Alternative water sources: On city water
drinking, cooking, bathing

FILE: ARGO PA/

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Francis Mauro

Street Address: 5607 N. Washington

City, State, Zip Code:

Telephone Number (H):
(W):

****

Years lived on property:

Well present on property: yes no already tested

Years well present on property:

State Engineers well permit: yes no Permit No:

Well depth: Well yield:

Well construction:

Well usage: drinking source bathing

garden irrigation other (specify)

Alternative water sources:

FILE: ARGO PA/

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Ed Vanderpool

Street Address: 5796 Emerson St

City, State, Zip Code: Denver, CO 80216

Telephone Number (H):
(W): 296-4404

****

Years ~~lived~~ on property: commercial

Well present on property: yes

Years well present on property: ?

State Engineers well permit: yes no ? Permit No:

Well depth: ? Well yield:

Well construction:

Well usage: We have never drinking source bathing
used this well
garden irrigation other (specify)

Alternative water sources:
North Washington Street Water

LE: ARGO PA/

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Public Service Co. - Dave Waselkow

Street Address: 6198 N. Franklin

City, State, Zip Code: 80216

Telephone Number ~~(H)~~: 286-6210
(W):

****

Years lived on property: 3 deep + 1 capped deep well (1960's
4 shallow well

Well present on property: yes no 1 drinking well not used (Miller we

Years well present on property:

State Engineers well permit: yes no Permit No:

Well depth: Well yield:

Well construction:

Well usage: drinking source bathing

Use for cooling garden irrigation other (specify)
1950's + 1960's
No wells now used

Alternative water sources:

Contact Mike Everad water mgr. for PSC of Colo.
294-8005

FILE: ARGO PA/

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Mr. Satriano

Street Address: 6280 N. Franklin

City, State, Zip Code: Denver, CO 80216

Telephone Number (H):
(W):

****

Years lived on property: 60 years

Well present on property: yes no

Years well present on property:

State Engineers well permit: yes no Permit No:

Well depth: Well yield:

Well construction:

Well usage: drinking source bathing

garden irrigation other (specify)

Alternative water sources:

on city water

ILE: ARGO PA/

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Morrow Crane Co.

Street Address: 6350 N. Franklin

City, State, Zip Code: 80216

Telephone Number (H): 287-2866
(W):

****

Years lived on property: 8 years

Well present on property: yes no

Years well present on property:

State Engineers well permit: yes no Permit No:

Well depth: Well yield:

Well construction:

Well usage: drinking source bathing

not in use
covered over

garden irrigation other (specify)

Alternative water sources:

on city water

FILE: ARGO PA/

718

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: 5800 5802 5806 5808 Franklin

Street Address: 5800 Franklin including:

City, State, Zip Code: Denver CO

Telephone Number (H): 1609 E 58th 1707-1709 E 1721-1723 1751 1761 1791 1777 1805 E 58th

(W):

****

Years lived on property: Building 10 years old 50 years old property

Well present on property: yes no in 5800 Franklin

Years well present on property:

State Engineers well permit: yes no Permit No:

Well depth: Well yield:

Well construction:

Well usage: drinking source bathing

not used garden irrigation other (specify)

Alternative water sources:

ILE: ARGO PA/

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Champion Box Beef / Litvak

Street Address: 5900 York

City, State, Zip Code: Denver, CO 80216

Telephone Number ~~(H)~~
(W): 288-0766

****

Years lived on property: ~~15 yrs~~ 56 yrs. 3 shallowwells, 2 deep wells (one N, one S)

Well present on property: yes no

Years well present on property:

State Engineers well permit: yes no shallow wells Permit No:

Well depth: Well yield:

Well construction:

Well usage: drinking source bathing

1 Cooling garden irrigation other (specify)

shallow compressors, wash trucks, irrigation (not currently)

Alternative water sources:

ILE: ARGO PA/

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name: Connie Youngworth

Street Address: 2000 64th

City, State, Zip Code: Denver CO

Telephone Number (H): 288-7316
(W):

****

Years lived on property: ~~owns at 1980 64th~~

Well present on property: yes no

Years well present on property:

State Engineers well permit: yes no Permit No:

Well depth: Well yield:

Well construction:

Well usage: drinking source bathing

garden irrigation other (specify)

Well water used by 2020 E. 64th and 1980 E. 64th

Alternative water sources:

None

ILE: ARGO PA/

721

Date: APRIL 8, 1992

ARGO DOMESTIC WELL SURVEY
PERFORMED BY AUSTIN N. BUCKINGHAM
PRELIMINARY ASSESSMENT PROGRAM/CDH

Name:

Street Address: 5910 Humboldt

City, State, Zip Code:

Telephone Number (H):
(W):

****

Years lived on property:

Well present on property: yes ? no has pump doesn't work

Years well present on property:

State Engineers well permit: yes no Permit No:

Well depth: Well yield:

Well construction:

Well usage: drinking source bathing

garden irrigation other (specify)

Alternative water sources:

FILE: ARGO PA/

714